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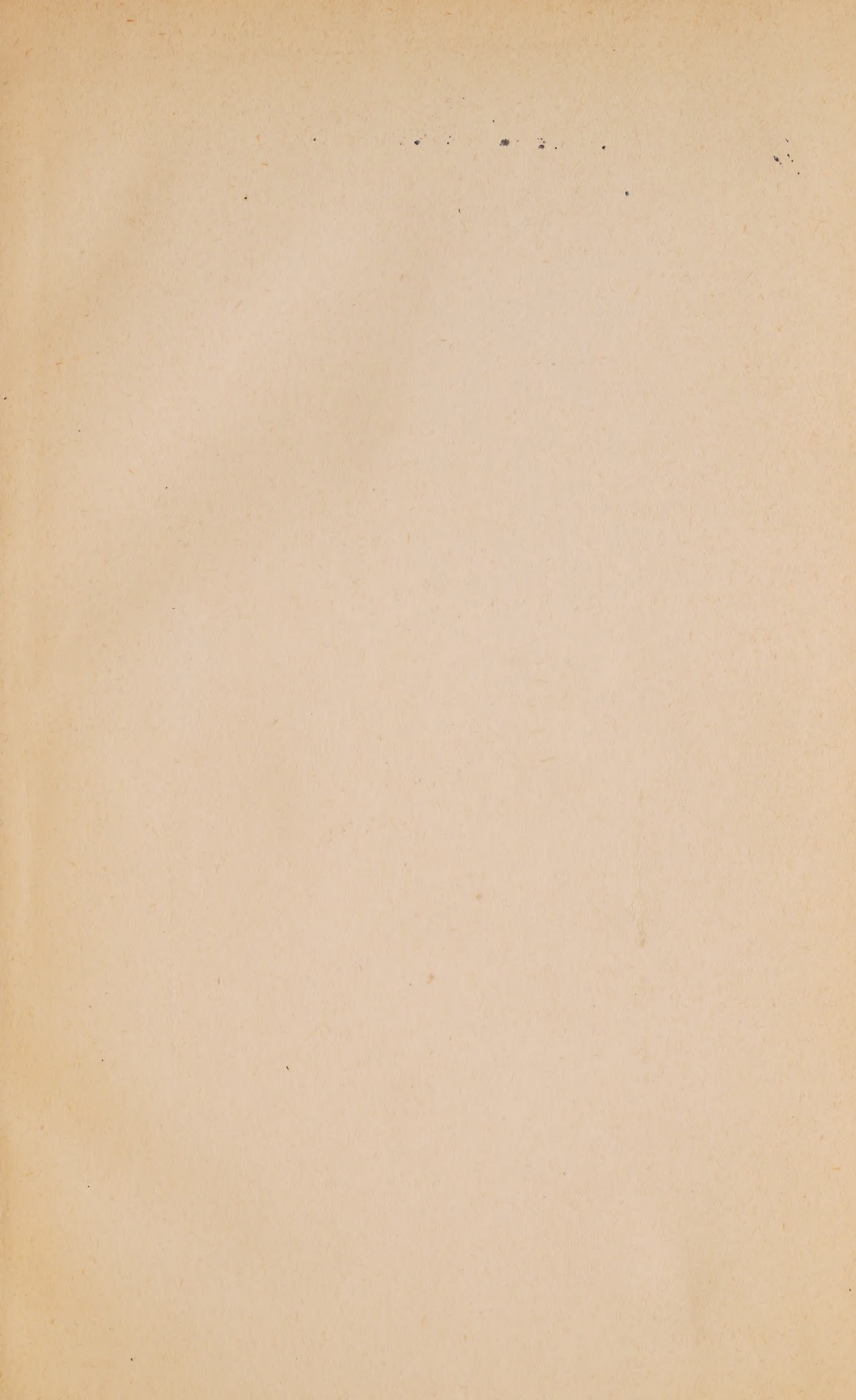
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Wills MacLachlan



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*Ontario Hydro Electric Power
Commission*
Gov. Doc
Ont. (Fifth) Annual Report
H

OF THE

HYDRO-ELECTRIC POWER COMMISSION

OF THE

PROVINCE OF ONTARIO

FOR YEAR ENDED OCTOBER 31st

1912


PRINTED BY ORDER OF
THE LEGISLATIVE ASSEMBLY OF ONTARIO



TORONTO:

Printed and Published by L. K. CAMERON, Printer to the King's Most Excellent Majesty

1913



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TORONTO, March 1st, 1913.

HONOURABLE ADAM BECK,

*Chairman, Hydro-Electric Power Commission,
Toronto, Ont.*

SIR,—I have the honour to transmit herewith the Fifth Annual Report of the Hydro-Electric Power Commission of Ontario for the fiscal year ending October 31st, 1912.

I have the honour to be,

Sir,

Your obedient servant,

W. W. POPP,

Secretary.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

HON. ADAM BECK, London, Chairman.

HON. JOHN S. HENDRIE, C.V.O., Hamilton, Commissioner.

W. K. MCNAUGHT, M.P.P., Toronto, Commissioner.

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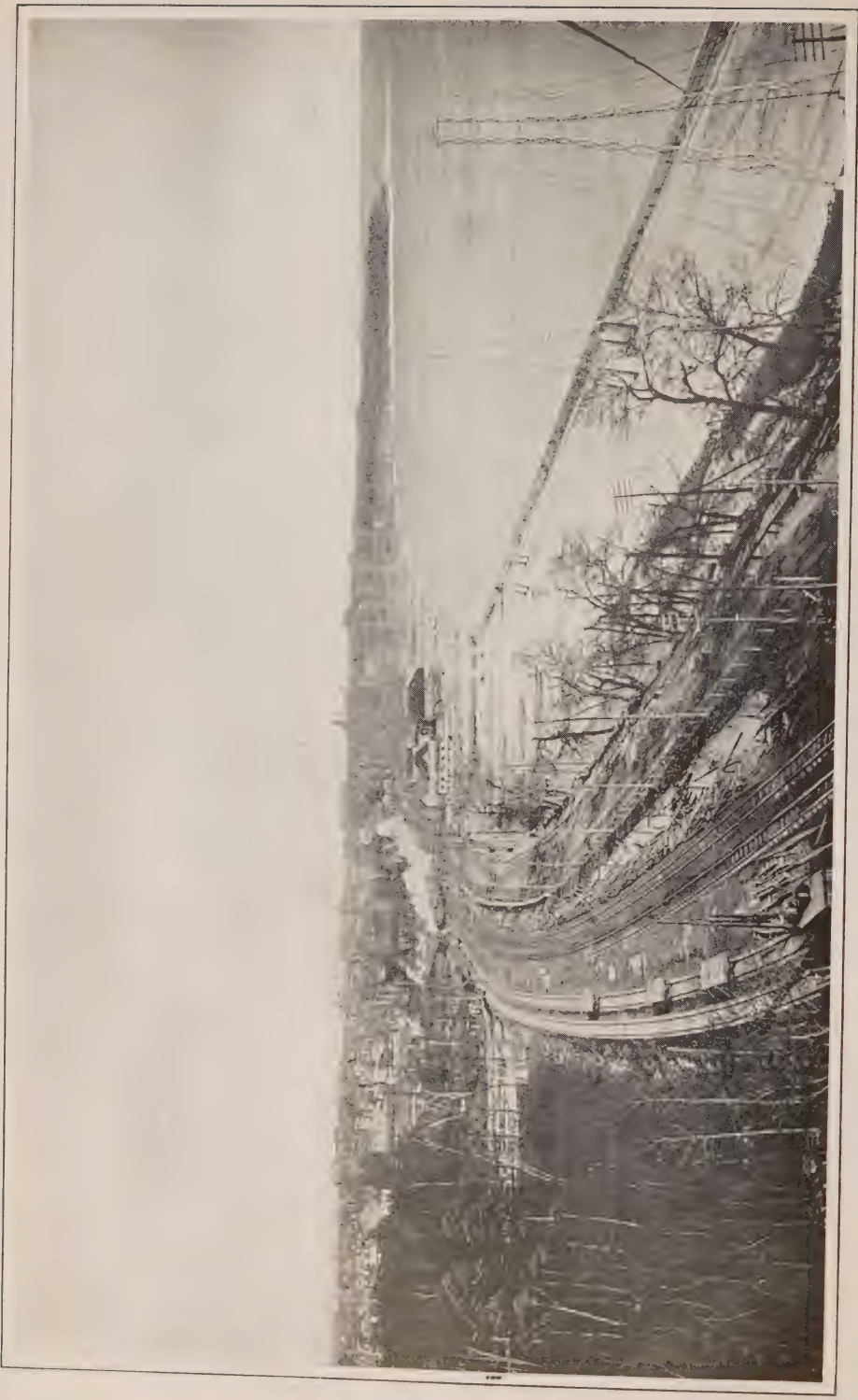
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Toronto Entrance Towers , Humber Bay

FIFTH ANNUAL REPORT

OF THE

Hydro-Electric Power Commission

CHAPTER I

LEGAL PROCEEDINGS

ACTS

The following Act concerning the Hydro-Electric Power Commission and known as the "Power Commission Amending Act of 1912," was passed by the Legislature of Ontario during the Session of 1912.

This Act invests the Commission with additional powers and, among other things, enables it to regulate water privileges and provide for the conservation of water powers through the development of storage works; empowers it to acquire by purchase or expropriation, when necessary or desirable, the whole or parts of the existing electric distributing plants in the various municipalities contracting for supply of power, and to contract for the sale and transfer of the same to the respective municipal corporations. It also provides for the regulation of the construction and standardization of electrical equipment, as well as the control of rates at which electric energy is to be sold, the methods of book-keeping to be employed by the municipal corporations operating distributing plants, and the application of surplus receipts to one of the accounts specified in the Act. Besides this, it confers the authority to order wires to be placed underground in cities and towns where such procedure is necessary, and confirms a number of by-laws and contracts passed by the various municipalities.

The Power Commission Act, 1912

An Act to amend the Power Commission Act.
(2 Geo. V., chap. 14.)

Assented to 16th April, 1912.

HIS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1. This Act may be cited as *The Power Commission Act, 1912*. Short title.
2. Section 5 of *The Power Commission Act* is repealed, and the following section substituted therefor:— Edw. VII.
c. 19, s. 5,
amended.
- 5.—(1) The Chairman of the Commission shall be paid out of such moneys as may be voted by the Legislature for the general purposes of the Commission, such annual salary or other remuneration not exceeding Six Thousand Dollars (\$6,000) per annum, as may be determined by the Lieutenant-Governor in Council. Salary of
Chairman of
Commission.

Seat not vacated, nor penalties incurred thereby.

8 Edw. VII. c. 5.

- (2) Notwithstanding anything contained in *The Legislative Assembly Act*, the said Chairman shall not by reason of such salary or remuneration or the acceptance thereof avoid his election or vacate or forfeit his seat, or incur any of the penalties imposed by the said Act for sitting and voting thereafter as a member of the Legislative Assembly.

Salaries of other members of Commission.

- (3) The members of the Commission other than the Chairman or a member of the Legislative Assembly shall be paid out of such moneys as may be voted by the Legislature for that purpose, such annual salary or other remuneration as may be fixed by the Lieutenant-Governor in Council.

Commencement of section.

- (4) This section shall take effect as from the thirty-first day of October, A.D. 1911.

7 Edw. VII. c. 19, s. 8, amended.

3. Section 8 of *The Power Commission Act* is amended by striking out the words "and supply" in the 6th line of clause *b* in the said section, and inserting in lieu thereof the words "supply and distribution," and by adding to the said section the following clauses:—

Flooding lands and improving water powers.

- (d) To enter upon, take and use without the consent of the owners thereof, any lands upon which any water power or privilege is situate, or any lake, river, stream or other body of water, which in the opinion of the Commission is capable of improvement or development for the purpose of providing water power, and to construct such dams, sluices, canals, raceways and other works, as may be deemed proper or expedient for that purpose, and to flood and overflow any lands as may be deemed necessary for the purpose of providing storage of the water, or for any other purpose in connection with such works, and to contract with any municipal corporation, company or individual for the use of any of the improvements or works so made, on such terms and conditions as may be agreed on, and to charge such tolls for the use of the water power or improvements or works, by any municipal corporation, company or individual as the Commission may deem reasonable, having regard to the cost of acquiring such lands, and of the construction, maintenance and operation of such improvements or works.

Acquiring distributing plant.

- (dd) To acquire by purchase or to expropriate any plant, machinery, appliances, wires, poles and other equipment, and the lands occupied by or used in connection with the same, or any part thereof used or intended for the distribution of electrical power or energy in a municipality, the corporation of which has entered into an agreement with the Commission for the supply of electrical power or energy, and to contract for the sale and transfer to such municipal corporation of such plant, equipment and lands upon such terms and for such price, not being less than the price paid by the Commission, with the expenses in connection with such purchases or expropriation added thereto, but if part only of the property is taken the damage done to the property by the severance shall be taken into consideration in determining the compensation.

4. *The Power Commission Act* is amended by inserting therein the following as section 10a. 7 Edw. VII.
c. 19,
amended.

10a.—(1) Where any of the compulsory powers mentioned in section 8 are exercised with respect to land and no entry on or use of the land taken has been made, except for the purpose of survey or examination, the Commission at any time before the expiration of three months from the date of the award, may, by writing under the hand of the Chairman and the Seal of the Commission, registered in the proper Registry or Land Titles Office, declare that the land or any part thereof is not required and is abandoned by the Commission, and thereupon the land declared to be abandoned shall revert to the person from whom it was taken, or in those entitled to claim under him. Abandonment of lands after expropriation.

(2) Where the land taken, or any part thereof, is abandoned, the person from whom it was taken shall be entitled to all damages sustained, and all costs incurred by him in consequence of the taking and abandonment; and where part only of the land is abandoned, the fact of such abandonment, and the damages, if any, sustained in consequence of that which is abandoned having been taken, and all the other circumstances of the case shall be taken into account in determining the amount to be paid to any person claiming compensation, and the amount of the damages shall be determined in the manner provided by *The Public Works Act*, and, if a reference as to compensation is pending, shall be determined on such reference. Total abandonment.

Partial abandonment.

5. Subsection 2 of section 12 of *The Power Commission Act, 1911*, is amended by inserting the words "or the question as to a supply of electrical power or energy provided for by section 11 of *The Power Commission Amendment Act, 1909*," after the word "Act," where the same appears in the fourth line, and by inserting the words "or by this Act" after the word "Act," where the same appears in the seventh line of the said subsection. 1 Geo. V.
c. 14, s. 12,
ss. (2),
amended.

9 Edw. VII.
c. 19.

6. Subsection 2 of section 14 of *The Power Commission Act* is repealed, and the following substituted therefor:— 7 Edw. VII.
c. 19, s. 14,
(2),
repealed.

(2) The council of a municipal corporation may, if they see fit, submit to the electors a by-law providing for borrowing by the issue of debentures, the money required for any of the purposes mentioned or referred to in sections 12, 13 and 14 of *The Power Commission Act*, at the same time as such council submits to the electors a by-law approving of a provisional contract entered into under section 12 of the said Act, or a question as to a supply of electrical power under section 11 of *The Power Commission Amendment Act, 1909*, and such by-law for borrowing money may be finally passed by such council either before or after such corporation has entered into a contract with the Commission for the supply of electrical power or energy, but the debentures authorized by such by-law shall not be issued until the corporation has entered into a contract with the Commission for the supply of such electrical power or energy. Mode of submitting by-law to electors.

7 Edw. VII.
c. 19, s. 18,
cl. c,
amended.

7. The clause lettered *c* in section 18 of *The Power Commission Act* is amended by inserting after the word "operating" in the first line the word "supervising."

7 Edw. VII.
c. 19, s. 22,
subsections
4 and 5,
10 Edw. VII.
c. 16,
repealed.

8. Subsection 4 and 5 of section 22 of *The Power Commission Act*, as enacted by section 4 of the Act passed in the tenth year of the reign of His late Majesty King Edward the Seventh, chaptered 16, are repealed.

7 Edw. VII.
c. 19,
amended.

9. *The Power Commission Act* is amended by adding thereto the following sections—

Regulations

22a.—(1) The Commission may make regulations as to

As to equip-
ment.

(a) The construction, operation and inspection of the works, plant, machinery, apparatus, appliances and equipment for the transmission, distribution, connection, installation and use of electrical power or energy by municipal corporations, and by any railway, street railway, electric lighting, power or transmission company, or by any other company or individual, transmitting, distributing, installing or using electrical power or energy, or whose undertaking, works, or premises are connected with any plant for transmission or distribution of electrical power or energy.

As to inspec-
tion.

(b) Requiring the appointment of inspectors by the corporation of any municipality for the purpose of enforcing the due observance of such regulations.

Ordering
changes in
plans and
equipment.

(2) The Commission may at any time order the installation, removal or alteration of any works, plant, machinery, apparatus, appliances or equipment, as in the opinion of the Commission may be necessary for the safety of the public or of workmen, or for the protection of property against damage by fire or otherwise.

Rates.

22b.—(1) The rates chargeable by any municipal corporation generating or receiving and distributing electrical power or energy, shall at all times be subject to the approval and control of the Commission; and the rates charged by any company or individual receiving power from the Commission for the supply of electrical power or energy shall at all times be subject to such approval and control.

Prescribing
system of
bookkeep-
ing, etc.

(2) The Commission may prescribe a system of bookkeeping and keeping accounts of the assets, liabilities, revenue and expenditure of any municipal corporation or municipal commission, and may require from such municipal corporation or commission such returns and statements as the Commission may deem proper, and may extract from such books, returns and statements such information as in the opinion of the Commission may be useful for publication, and may embody the same in the reports of the Commission.

- (3) Section 57 of *The Ontario Railway and Municipal Board Act, 1906*, 6 Edw. VII. c. 31, s. 57, shall not apply to municipal corporations or commissions, which are subject to the provisions of this section, so far as the said section relates to the development or distribution of electrical power or energy.

22c. Whenever it appears from the accounts of a municipal corporation or municipal commission that after providing for any payments required to be made on account of principal or interest of any debentures issued for the construction and equipment of works and plant for the production, development or distribution of electrical power or energy, and in the case of a municipal corporation or municipal commission receiving electrical power or energy from the Commission for distribution, after providing for payments required by this Act, that there is a surplus at the credit of the municipal corporation or municipal commission, such surplus shall be applied and disposed of in such manner as the Commission may by general regulation or special order direct,

Where accounts of corporation show a surplus.

(a) In the reduction of any indebtedness incurred with respect to the construction and equipment of such works and plant, or

(b) In the maintenance, repair or renewal thereof, or

(c) In the extension of such works and plant, or

(d) In the formation of a fund to be used at a future time for any of such purposes.

22d. A municipal corporation or municipal commission and any company or individual neglecting or refusing to obey and carry out any order or direction of the Commission or of a member thereof, made under section 22, or of the Commission made under section 22a, section 22b, or section 22c, in addition to any other liability, shall forfeit to His Majesty for the use of the Province the sum of \$100 for every day during which such neglect or refusal shall continue.

Orders of Commission.
Penalty for disobeying.

22e.—(1) Where the Commission is of opinion that it is necessary or expedient for the protection of life or property or for the convenience of the public that the use of overhead lines upon any highway or public communication or part thereof in a city or town, including the wires of telegraph, telephone, electric light, heat, or power companies, shall be discontinued, the Commission may so direct and upon such terms and subject to such conditions as it may prescribe may require that such wires be placed and carried in underground conduits, to be constructed and maintained in accordance with the directions and to the satisfaction of the Commission, and may abrogate any right to carry lines on poles in such city or town which may have been given by any Act or by any municipal by-law, license or agreement.

Ordering wires underground.

(2) In this section and in sections 22f to 22j

Municipal wires.

Municipal
wires.

(a) "Lines" shall mean and include the wires, cables or other conductors used by a company for the purpose of conveying or distributing electricity or electrical power or energy, for telegraph, telephone, or electric light, heat or power purposes.

(b) "Company" shall include a municipal corporation or municipal commission, a partnership and an individual, owning, leasing, using or controlling lines in a city or town.

Construction
of tunnel
by municipal
corporation.

22f. Where the corporation of the city or town is willing to undertake the construction of a tunnel or conduits or other system for carrying lines underground in any highway or public communication or part thereof, the Commission upon such terms and subject to such conditions as it may prescribe may require all companies and persons whose lines are carried overhead upon any such highway or public communication to make use of such tunnel or conduits or other system for the purpose of carrying their lines and to pay to the corporation such compensation for the use thereof as may be agreed upon or as the Commission may determine, and such compensation may be either a lump sum or a sum to be paid annually or periodically, as the Commission may determine and direct.

Powers of
corporation
of city or
town.

22g. Where the corporation of a city or town desires to construct a tunnel, conduits or other system for the purpose mentioned in the next preceding section, it shall be lawful for the corporation to do so, and to exercise in respect thereof the powers of expropriation conferred upon the corporation by *The Municipal Act*.

Work sub-
ject to
direction of
Commission.

22h. All works undertaken under the provisions of the next preceding two sections shall be done in accordance with the directions and to the satisfaction of the Commission, and shall be maintained, kept in repair, altered, enlarged or improved to the satisfaction of the Commission, and as it may from time to time direct.

Penalty.

22i. If any order or direction of the Commission for discontinuing the use of overhead lines is not obeyed, the lines, poles and other structures in connection therewith upon the highway or public communication shall be deemed to be unlawfully erected and maintained, and may be removed by or under the direction of the Commission, and at the expense of the owner or user of them, and the company owning or using such lines shall incur a penalty of \$100 a day for the time during which the order of the Commission is disobeyed.

Joint order
by Commis-
sion and
Dominion
Railway
Board.

22j. Where lines, the construction or operation of which is authorized by this Legislature; and lines the construction of which is authorized by the Parliament of Canada, run through or into the same city or town, and the corporation of such city or town is desirous of having such lines placed underground, the Commission and the Board of Railway Commissioners for Canada, may, after the receipt of the applications hereinafter mentioned, by joint session or conference by them, hear and determine the application, and may order on such terms and conditions as they may prescribe any company constructing or operating lines in the city or town to place such lines underground, and may abrogate any right to carry lines on poles in such city or town, which may have been given by any Act or municipal by-law, license or agreement.

(a) Any such company or any municipal corporation or other public body, or any person or persons interested, may file with the Secretary of the Commission, and with the Secretary of the Board of Railway Commissioners for Canada, the application for an order under this section, together with evidence of the service of such application, upon the company or companies interested or affected, and where the application is not made by the municipal corporation, upon the head of the municipal corporation within which the lines are situate.

(b) The Chairman of the Commission and the Chairman of the Board of Railway Commissioners for Canada may make rules of procedure and practice, covering the making of such applications and the hearing and disposition thereof, and may vary, alter or rescind the same from time to time.

(c) The Chairman of the Commission and the Chairman of the Board of Railway Commissioners for Canada may, from time to time, assign or appoint from each body the members comprising the joint Board that may be required to sit for the hearing and determining of such applications as they arise.

(d) Any such order may be made a rule of the Exchequer Court of Canada, and may be enforced in like manner as any rule, order or decree of such Court.

10. Section 2 of *The Power Commission Amendment Act, 1911*, is amended by striking out the words "and an incorporated company" in the second line of clause (d) of that section, and inserting in lieu thereof the words "and incorporated company or an individual or firm." 1 Geo. V.
c. 15, s. 2,
amended.

11. The municipal corporations of the City of Hamilton; Villages of Certain Norwich, Port Stanley, Mimico and Waterdown, and the Police Villages of Baden, Beachville, Port Credit and Thamesford are added as parties of the Second Part to the contract set out as Schedule "A" to *The Power Commission Act, 1909*, as varied and confirmed by the said Act, and as further varied and confirmed by the Act passed in the tenth year of the reign of His late Majesty King Edward the Seventh, chaptered 16, as amended by this Act, and the said contract shall be binding municipal
corporations
added as
parties to
contract.
9 Edw. VII.
c. 19, Sched.
"A."
as to the City of Hamilton from the 31st of October, 1911;
as to the Village of Norwich from the 4th of March, 1910;
as to the Village of Port Stanley from the 6th of October, 1911;
as to the Village of Mimico from the 14th of October, 1911;
as to the Village of Waterdown from the 10th of October, 1911;
as to the Police Village of Baden from the 29th of August, 1911;
as to the Police Village of Thamesford from the 21st of November, 1911;
as to the Police Village of Beachville from the 1st day of February, 1912;
as to the Police Village of Port Credit from the 13th day of February, 1912.

12. The names of such municipal corporations are added to Schedule "B" Schedule to the said contract, and such Schedule shall be read as containing the particulars set out in Schedule "A" to this Act. contract
amended.

By-laws confirmed.
Hamilton.
Norwich.
Midland.
Mimico
Waterdown.

13. By-law No. 1165 of the Corporation of the City of Hamilton;
By-law No. 523 of the Corporation of the Village of Norwich;
By-law No. 772 of the Corporation of the Town of Midland;
By-laws Nos. 13 and 14 of the Corporation of the Village of Mimico.
By-laws Nos. 182 and 186 of the Corporation of the Village of Waterdown;

Port Stanley.
Thamesford.
Baden.
Beachville.
West Oxford.
Port Credit.
Toronto.

- By-law No. 311 of the Corporation of the Village of Port Stanley;
By-law No. 16 of the Corporation of the Police Village of Thamesford;
By-law No. 485 of the Corporation of the Police Village of Baden;
By-law No. 8 of the Corporation of the Police Village of Beachville;
By-law No. 557 of the Corporation of the Township of West Oxford;
By-law No. 785 of the Corporation of the Police Village of Pt. Credit;
By-law No. 791 of the Corporation of the Township of Toronto,

are confirmed and declared to be legal, valid and binding upon such corporations and the ratepayers thereof, respectively, and shall not be open to question upon any ground whatsoever, notwithstanding the requirements of *The Power Commission Act*, or the amendments thereto, or of any other statute.

7 Edw. VII.
c. 19.

Contracts confirmed.

14. The contracts heretofore entered into by such corporations, respectively, with the Commission are confirmed and declared to be legal, valid and binding upon the parties thereto, respectively, and shall not be open to question upon any ground whatsoever, notwithstanding the requirements of *The Power Commission Act*, or the amendments thereto, or of any other statute.

By-law No. 1193 of City of Hamilton confirmed.

- 15.—(1) By-law No. 1193 of the City of Hamilton, set out in the Schedule "B" to this Act, is confirmed and declared to be legal, valid and binding, and the Commission and the Corporation of the said City are authorized to do whatever may be necessary to carry out said by-laws and any contract entered into in pursuance thereof.

10 Edw. VII.
c. 16, s. 5,
repealed as
to Hamilton.

- (2) Section 5 of the Act respecting the Hydro-Electric Power Commission of Ontario, passed in the tenth year of the reign of His late Majesty King Edward the Seventh, chaptered 16, is repealed, so far as the same relates to the Corporation of the City of Hamilton, and any proceedings heretofore taken, and any by-law passed or contract entered into thereunder, is cancelled, and shall be void and of no effect.

Contract between Commission and City of Hamilton confirmed.

- (3) The contract entered into between the Commission and the Corporation of the City of Hamilton, dated the 31st day of October, 1911, set out as Schedule "C" hereto, is confirmed and declared to be legal, valid and binding upon the parties hereto, respectively, and shall not be open to question upon any ground whatsoever, notwithstanding the requirements of *The Power Commission Act*, or the amendments thereto, or of the Act passed in the tenth year of the reign of His late Majesty King Edward the Seventh, chaptered 16, or any other general or special Act of this Legislature, or any by-law or agreement heretofore passed or entered into.

By-law No. 210 of St. Mary's confirmed.

16. By-law No. 210 of the Municipal Corporation of the Town of St. Mary's, passed on the 23rd day of October, 1911, for raising \$15,000 for electric light and power purposes, is confirmed and declared to be legal, valid and binding, notwithstanding any defect in substance or form therein or any irregularity in the manner of passing the same, and the debentures issued as provided by the said by-law shall be legal and valid and binding upon the said corporation and the ratepayers thereof.

SCHEDULE "A."
Additions to Schedule "B" to the Contract set out in Schedule "A," 9 Edw. VII., C. 19.

Name of Municipal Corporation.	Quantity of Power applied for in H.P.	Maximum Price of Power at Niagara Falls.	Number of Volts.	Estimate Maximum Cost of Power ready for distribution in Municipality.	Estimated Proportionate Part of Cost to Construct Transmission Lines, Transformer Stations and Works for nominally 30,000 H.P., with total capacity of 60,000 H.P.	Estimate of Proportionate Part of Line Loss and of Part Cost to Operate, Maintain Transformer Stations and Works for nominally 30,000 H.P., with total capacity of 60,000 H.P.
Hamilton	2,000	.....	.....	\$17 32	\$104,760	\$9,784 00
Norwich.....	150	.....	.....	30 00	20,832	1,875 00
Port Stanley.....	50	.....	.....	79 89	33,375	1,589 00
Mimico.....	50	.....	.....	30 74	7,448	635 00
Waterdown	50	.....	.....	37 50	11,540	736 00
Baden.....	40	.....	.....	36 95	8,316	620 00
Thamesford.....	100	.....	.....	48 73	33,556	1,987 00
Beachville.....	80	.....	.....	33 89	15,788	1,043 00
Port Credit	30	.....	.....	36 79	7,146	408 00

SCHEDULE "B."

By-Law No. 1193.

To authorize the Corporation of the City of Hamilton to enter into a contract with the Hydro-Electric Power Commission of Ontario, varying the Agreement appended as a Schedule to By-law No. 906.

The Council of the Corporation of the City of Hamilton enacts as follows:—

1. The Mayor and City Clerk are hereby authorized and directed to execute, under the Corporate Seal of the City of Hamilton, the contract with the Hydro-Electric Power Commission of Ontario, appended as a Schedule to this By-law, varying the agreement appended to By-law No. 906, passed by this Council on the 29th day of November, 1909.

Passed this 31st day of October, A.D., 1911.

GEO. H. LEES,
Mayor.

S. H. KENT,
City Clerk.

SCHEDULE.

This Indenture made the 31st day of October, 1911.

Between

The Hydro-Electric Power Commission of Ontario (hereinafter called the "Commission") of the first part,

and

The Corporation of the City of Hamilton (hereinafter called the "Corporation") of the second part.

Whereas the parties hereto, by an agreement appended as a Schedule to By-law No. 906 of the Council of the Corporation of the City of Hamilton, passed on the 29th day of November, 1909, entered into a contract for the supply, by the Commission to the Corporation, of electric power, and it was therein provided that at any time prior to the 31st day of December, 1910, the Corporation may agree with the Commission to vary such contract in such manner that the Corporation shall be entitled to all rights and benefits of the agreement dated the 4th day of May, 1908, being Schedule "A" of *The Power Commission Act, 1909*, made between the Commission and the Municipal Corporation of Toronto and others, and on the 28th day of November, 1910, application was made by resolution of the Council of the Corporation to extend the time to enter into such agreement until the 31st day of December, 1911, and the time was extended by the Commission.

Now this Indenture witnesseth that, in consideration of the premises, the parties hereto hereby agree as follows:—

1. The said agreement appended to said By-law No. 906 is hereby varied in the following manner:

(a) By striking out paragraph 1 (b) and inserting the following paragraph in lieu thereof:

"1.—(b) On the first day of June, 1910, to supply said power in quantities set forth in column 2 of said schedule, or, as a minimum, 40 per cent. less, if written notice of minimum required is given on or before 19th day of July, 1909, to the Corporations, within the limits thereof, ready for distribution at approximately the number of volts set forth in column 4 of said schedule, and approximately 25 cycles per second frequency."

(b) By striking out paragraph 2 (b) and inserting in lieu thereof the following:—

"2.—(b) To take electric power exclusively from the Commission during the continuance of this agreement; provided, if the Commission is unable to supply said power as quickly as required, the Corporations may obtain the supply otherwise until the Commission has provided such supply, thereupon the Corporations may generate, store or accumulate electric power for emergencies, or to keep down the peak load of the power taken from the Commission, and nothing herein contained shall affect existing contracts between the Corporations and other parties for a supply of electric power, but the Corporations shall determine said contracts at the earliest date possible."

(c) By striking out of paragraph 4 all the words after the word "hereto," commencing with the words "Said Meters."

(d) By striking out the letter (a) where it appears after the figures "10" in paragraph 2 (c) and 2 (e).

(e) By striking out paragraphs 10 (a), 10 (b), 10 (c) and 10 (d), and inserting in lieu thereof the following:—

"10. The Commission shall, at least annually, adjust and apportion the amounts payable by municipal corporations for such power and such interest, sinking fund, line loss, and cost of operating, maintaining, repairing, renewing and insuring the line and works."

(f) By striking out the last sentence of paragraph 11, commencing with the words "No power," and inserting in lieu thereof the following:

"No power shall be supplied by any municipal corporation to any railway or distributing company, or any other corporation or person without the written consent of the Commission."

(g) By inserting the following paragraphs as 13 (a) and 13 (b):

"13. Each of the Corporations agrees with the other:

“(a) To take electric power exclusively from the Commission during the continuance of this agreement, subject to the provisoes above set forth in paragraph 2 (b).

“(b) To co-operate, by all means in its power, at all times, with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement and of said Act.”

(h) Section 13 shall be numbered 14, and section 14 shall be numbered 15.

(i) By striking out opposite the word “Hamilton” in the schedule appended to the said agreement in columns 2, 5, 6, and 7, the figures 1,000, 17.92, 84,384, and 3,620, and inserting in said columns respectively opposite the said word “Hamilton” in said schedule, the following figures: 2,000, 17.32, 104,760, 9,784.

2. The Corporation and the Commission shall be entitled to all rights and benefits of the said agreement of the 4th day of May, 1908, as if the Corporation was originally a party thereto.

3. To apply at the next session of the Legislature of Ontario to have the foregoing agreement validated, ratified and confirmed.

In witness whereof the Commission and the Corporation have respectively affixed their Corporate Seals under the hands of their proper officers.

SCHEDULE “C.”

As amended by By-law No. 1193, passed on 31st October, 1911.

This Indenture made the 4th day of May, 1908.

Between

The Hydro-Electric Power Commission of Ontario, acting herein on its own behalf, and with the approval of the Lieutenant-Governor in Council (hereinafter called the Commission), party of the first part,

and

The Municipal Corporations of Toronto, London, Guelph, Stratford, St. Thomas, Woodstock, Berlin, Galt, Hespeler, St. Mary's, Preston, Waterloo, New Hamburg, Ingersoll, and Hamilton (hereinafter called the Corporations), parties of the second part.

Whereas, pursuant to “an Act to provide for transmission of electrical power to municipalities,” the Corporations applied to the Commission to transmit and supply such power from Niagara Falls and the Commission entered into contracts, hereto attached, with the Ontario Power Company of Niagara Falls (hereinafter called the Company), for such power at the prices set forth in the schedule, hereto attached, and the Commission furnished the Corporations with estimates, as shown in the schedules of the total cost of such power ready for distribution within the limits of the Cor-

porations, and the electors of the Corporations assented to By-laws authorizing the Corporations to enter into a contract with the Commission for such power, and the Commission have estimated the line loss and the cost to construct, operate, maintain, repair, renew, and insure a line to transmit, nominally, 30,000 horse power, with total capacity of 60,000 horse power of such power to the Corporations and have apportioned the part of such cost to be paid by each Corporation, as shown in said schedule.

Now, therefore, this Indenture witnesseth that, in consideration of the premises and of the agreements of the Corporations herein set forth, subject to the provisions of the said Act and of the said contracts, the Commission agrees with the Corporations respectively:

1.—(a) To construct a line to transmit the quantities of electric power, shown in column 2 of the said schedule from Niagara Falls to the Corporations shown in column 1 respectively.

(b) On the first day of June, 1910, to supply said power in quantities set forth in column 2 of said schedule, or, as a minimum, 40 per cent. less, if written notice of minimum required is given on or before 19th of July, 1909, to the Corporations, within the limits thereof, ready for distribution at approximately the number of volts set forth in column 4 of said schedule, and approximately 25 cycles per second frequency.

(c) At the expiration of three months' written notice, which may be given by the Corporations or any of them from time to time during the continuance of this agreement, to supply from time to time to the Corporations in blocks of not less than 1,000 horse power each additional power until the total amount so supplied shall amount to 30,000 horse power.

(d) At the expiration of nine months' like notice, which may be given by the Corporations, or any of them, from time to time, during the continuance of this agreement, to supply from time to time to the Corporations in blocks of not less than 1,000 horse power each additional power until the total amount so supplied shall amount to 100,000 horse power.

(e) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise all due skill and diligence, so as to secure the most perfect operation of the plant and apparatus of the Corporation.

In consideration of the premises and of the agreements herein set forth, each of the Corporations for itself, and not one for the other, agrees with the Commission:

2. (a) Subject to the provisions of paragraph 2 (g) hereof to pay the Commission for the quantities of power shown in column 2 of said schedule, or 40 per cent. less as a minimum to be supplied at said date and for such additional power supplied or held in reserve upon such notices, the price set forth in column 3 of said schedule in twelve monthly payments, in gold coin of the present standard of weight and fineness, and bills shall be rendered by the Commission on or before the fourth and paid by the Corpora-

tion on or before the fifteenth of each month. If any bill remains unpaid for 15 days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of such power to the Corporation in default until said bill is paid. No such discontinuance shall relieve the Corporation in default from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(b) To take electric power exclusively from the Commission during the continuance of this agreement; provided, if the Commission is unable to supply said power as quickly as required the Corporations may obtain the supply otherwise until the Commission has provided such supply, thereupon the Corporation shall immediately take from the Commission; and the Corporations may generate, store or accumulate electric power for emergencies, or to keep down the peak load of the power taken from the Commission, and nothing herein contained shall affect existing contracts between the Corporations and other parties for a supply of electric power, but the Corporations shall determine such contracts at the earliest date possible.

(c) To pay annually interest at four per cent. per annum upon its proportionate part of the moneys expended by the Commission on capital account for the construction of the said line, transformer stations and other necessary works shown, respectively, in column 6 of said schedule, subject to adjustment under paragraph 10.

(d) To pay an annual sum for its proportionate part of the cost of the construction of said line, stations and works, shown respectively in column 6 of said schedule, subject to adjustment under paragraph 10, so as to form in thirty years a sinking fund for the retirement of the securities to be issued by the Province of Ontario.

(e) To bear its proportionate part of the line cost and pay its proportionate part of the cost to operate, maintain, repair, renew, and insure the said line, stations, and works shown respectively in column 7 of said schedule, subject to adjustment under paragraph 10.

(f) To keep, observe and perform the covenants, provisoes, and conditions set forth in said contracts, intended by the Commission and the Company to be kept and observed and performed by the Corporations.

(g) To pay for three-fourths of the power supplied and held in reserve at said date and upon said notices, whether the said power is taken or not, and when the greatest amount of power taken for twenty consecutive minutes in any month shall exceed three-fourths of the amount during such twenty consecutive minutes, so supplied and held in reserve, to pay for this greater amount during that entire month. When the power factor of this greatest amount of power taken for said twenty minutes falls below 90 per cent., the Corporation shall pay for 90 per cent. of said power, divided by the power factor.

(h) To take no more power than the amount to be supplied and held in reserve at said date and upon said notices.

(i) To use at all times first-class, modern, standard, commercial apparatus and plant to be approved by the Commission.

(j) To exercise all due skill and diligence, so as to secure the most perfect operation of the plant and apparatus of the Commission and the Company.

3. If, as therein provided, the said contracts are continued until 19th of December, 1939, this agreement shall remain in force until that date.

4. Said power shall be three-phase, alternating, commercially continuous twenty-four hour power every day of the year except as provided in paragraph 6 hereof, and shall be measured by curve-drawing meters, subject to test as to accuracy by either party hereto.

5. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporations, and take records at all reasonable times on giving to the Corporation six hours' notice of the intention to make such inspection. The Corporations shall have a like right on giving a like notice to inspect the apparatus, plant and property of the Commission.

6. In case the Commission or the Company shall at any time or times be prevented from supplying said power, or any part thereof, or in case the corporations shall at any time be prevented from taking said power, or any part thereof, by strike, lock-out, riot, fire, invasion, explosion, act of God, or the King's enemies, or any other cause reasonably beyond their control, then the Commission shall not be bound to deliver such power during such time, and the corporations shall not be bound to pay the price of said power at Niagara Falls during such time, but the corporations shall continue to make all other payments, but as soon as the cause of such interruption is removed the Commission shall, without any delay, supply said power as aforesaid, and the corporations shall take the same, and each of the parties hereto shall be prompt and diligent in removing and overcoming such cause or causes of the interruption.

7. If, and so often as any interruption shall occur in the service of the Company, due to any cause or causes other than those provided for by the next preceding paragraph hereof, the Commission shall recover and pay to the Corporations as liquidated and ascertained damages and not by way of penalty, as follows: For any interruption less than one hour, double the amount payable for power which should have been supplied during the time of such interruption; and for any interruption of one hour or more, the amount payable for the power which should have been supplied during the time of such interruption and twelve times the last mentioned amount in addition thereto, and all moneys payable under this paragraph, when the amount thereof is settled between the Commission and the Company, may be deducted from any moneys payable by the Corporations to the Commission, but such right of deduction shall not in any case delay the said monthly payments.

8. The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the substation in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfillment of all operating obligations hereunder; and when voltage and frequency are so maintained the amount of the power, its fluctuations, load factor, power factor, distribution as to phase, and all other electric characteristics and qualities are under the sole control of the Corporations, their agents, customers, apparatus, appliances and circuits.

9. In case any municipal corporation, or any person, firm or corporation which shall contract with the Commission or with any municipal corporation for a supply of power furnished to the Commission by the Company, shall suffer damages by the act or neglect of the Company, and such municipal corporation, person, firm or corporation would, if the Company had made the said contracts directly with them, have had a right to recover such damages or commence any proceedings or any other remedy, the Commission shall be entitled to commence any such proceeding, or bring such action for or on behalf of such municipal corporation, person, firm or corporation, and notwithstanding any Acts, decision or rule of law to the contrary, the Commission shall be entitled to all the rights and remedies of such municipal corporation, person, firm or corporation, including the right to recover such damages, but no action shall be brought by the Commission until such municipal corporation, person, firm or corporation shall have agreed with the Commission to pay any cost that may be adjudged to be paid if such proceeding or action is unsuccessful. The rights and remedies of any such municipal corporation, person, firm or corporation shall not be hereby prejudiced.

10. The Commission shall, at least annually, adjust and apportion the amounts payable by municipal corporations for such power and such interest, sinking fund, line loss and cost of operating, maintaining, repairing, renewing and insuring the line and works.

11. If at any time any other municipal corporation, or, pursuant to said Act, any railway or distributing company, or any other corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the corporations, parties hereto, in writing, of a time and place, and hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favor of the applicants as to the price to be paid for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred and paid and to be paid by the corporations, parties hereto, appear equitable to the Commission, and are approved by the Lieutenant-Governor-in-Council.

No such application shall be granted if the said line is not adequate for such supply, or if the supply of the corporations, parties hereto, will be thereby injuriously affected, and no power shall be supplied within the limits of a municipal corporation taking power from the Commission at the time of such application, without the written consent of such corporation.

In determining the quantity of power supplied to a municipal corporation, the quantity supplied by the Commission within the limits of the corporation to any applicant, other than a municipal corporation, shall be computed as part of the quantity supplied to such corporation, but such corporation shall not be liable to pay for the power so supplied, or otherwise in respect thereof.

No power shall be supplied by any municipal corporation to any railway or distributing company, or any other corporation or person, without the written consent of the Commission.

12. It is hereby declared that the Commission is to be trustee of all property held by the Commission under this agreement for the corporations and other municipal corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the corporations and other municipal corporations, supplied by the Commission, having regard to the amounts paid by them, respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor-in-Council.

13. Each of the Corporations agrees with the other: (a) To take electric power exclusively from the Commission during the continuance of this agreement, subject to the provisos above set forth in paragraph 2 (b).

(b) To co-operate by all means in its power, at all times, with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement and of said Act.

14. If differences arise between the corporations the Commission may, upon application, fix a time and place to hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act respecting Enquiries Concerning Public Matters*.

15. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

16. The Corporation of the City of Hamilton and the Commission shall be entitled to all rights and benefits of the said agreement of the 4th day of May, 1908, as if the Corporation was originally a party thereto, and shall apply at the next session of the Legislature of Ontario to have the foregoing agreement validated, ratified and confirmed.

In witness whereof the Commission and the Corporations have respectively affixed their corporate seals and the hands of their proper officers.

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO,

Commissioners.

SCHEDULE "D".

Column 1	2	3	4	5	6	7
Name of Municipal Corporation.	Quantity of power applied for in H.P.	Maximum price of power at Niagara Falls.	No. of volts.	Estimated maximum cost of power ready for distribution in municipality.	Estimated proportionate part of cost to construct transmission line, transformer stations and works for nominally 30,000 H.P., with total capacity 60,000 H.P.	Estimated proportionate part of line loss and part cost to operate, maintain, repair, renew and insure transmission line, transformer stations and works for nominally 30,000 H.P. with total capacity of 60,000 H.P.
Toronto	10,000	\$9.40 for power at 12,000 volts until 25,000 H.P. or more are taken, then \$9 for all, \$10.40 for power at 60,000 volts until 25,000 or more are taken, then \$10 for all. If power taken at higher voltage, price to be fixed by arbitration.	Number required by each corporation.	\$18 10	\$828,080	\$38,970
London	5,000			23 50	671,089	31,578
Guelph	2,500			24 00	347,420	16,350
Stratford.....	1,000			27 10	173,580	8,120
St. Thomas	1,500			26 50	244,140	11,490
Woodstock.....	1,200			23 00	155,350	7,310
Berlin	1,000			24 00	138,970	6,540
Galt	1,200			22 00	143,920	6,773
Hespeler	300			26 00	63,200	2,974
St. Mary's	500			29 50	95,677	4,502
Preston	600			23 50	80,530	3,789
Waterloo	685			24 50	98,460	4,630
New Hamburg	250			29 50	47,830	2,251
Ingersoll	500			24 00	69,485	3,270
Hamilton	2,000			17 32	104,760	9,784

AGREEMENTS

During the fiscal year, agreements for a supply of power have been made with the municipalities of Port Credit, Coldwater, Acton, Barrie, Collingwood, Caledonia and Port Dalhousie.

RIGHT OF WAY

High Tension Lines

All claims for damages to land and property resulting from the construction of the High Tension Transmission System, which had not been settled during the periods covered by previous reports, were adjusted during the latter part of 1911, and the first part of 1912. The Right of Way Staff was then reduced to a chief agent, who arranged for the distribution and erection of gates in the fences along the cross country patrol routes as previously provided in the agreements and easements. It was decided to arrange as far as possible with the land owners along the line for the necessary posts, wire, material and labor to complete the installation of these gates. Accordingly, satisfactory arrangements made for the erection of some five hundred gates, the owners of the land undertaking to transport the gates from the distributing point to where they were to be installed, supply additional material and erect them at a price per gate previously agreed upon, which was to be paid when the work was completed.

Low Tension Lines

During the past year approximately one hundred and sixty miles of low tension pole lines have been constructed. To provide for these constructions easements and leases were secured from the various landowners as well as townships, where the route adopted for the transmission line bordered the highway, for the erection of poles and trimming of trees.

The agreements were similar to those secured during the previous year, and provided for the construction of the lines from Waubaushene to Collingwood, Barrie and Coldwater in the Severn District; Morrisburg to Prescott in the St. Lawrence District, and Dundas to Caledonia and Cayuga as well as from St. Thomas to Port Stanley in the Niagara District.

CROSSINGS

In addition to the privileges just mentioned, sanction was secured from the Board of Railway Commissioners at Ottawa for one hundred and twenty-five steam or electric railway, telephone or telegraph crossings. Blue prints were prepared of each of these crossings which, together with the formal application to the Company whose lines it was desired to cross, as well as other correspondence, involved a large amount of work. Provided that the parties interested consented, it was possible to make the crossing as provided under the Amendment to the Railway Act of 1910; otherwise, particularly in instances where a controversy occurred, application and additional blue prints were submitted to the Board of Railway Commissioners at Ottawa for consideration and, after proper investigation, an order secured authorizing the crossing.

UNDERGROUND CONSTRUCTIONS

The cities of Hamilton and Ottawa, acting in accordance with the powers granted them in the Power Commission Amending Act of 1912, made the following applications in the early part of the year for an order directing the power, telephone and telegraph companies in their respective cities to place their wires underground in certain streets.

Three joint meetings were held at Hamilton, Toronto and Ottawa to discuss the Hamilton application upon which action will shortly be taken.

Action is now pending on the Ottawa application.

Joint Application of the City of Ottawa

THE BOARD OF RAILWAY COMMISSIONERS FOR CANADA

and

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

The Corporation of the City of Ottawa hereby declares that it is desirous and willing to undertake the construction of a tunnel or conduits or other system for carrying lines of wires for the transmission of electricity in the following highways or parts of highways in the City of Ottawa, that is to say, on

Bank Street, from Wellington Street to Gladstone Avenue;

Wellington Street, from Bank Street to Lyon Street;

Queen Street, from Elgin Street to Bank Street;

Rideau Street, from Mackenzie Avenue to King Edward Avenue;

Dalhousie Street, from Rideau Street to St. Andrew Street;

and hereby applies to the Board and the Commission, in joint session, for an Order directing the construction, maintenance, repair and regulation of such tunnel or conduits or other system, and for an Order directing all companies and persons whose lines for the transmission of electricity are carried overhead upon any of the said highways, or the said parts thereof, to make use of such tunnel or conduits, or other system, for the purpose of carrying their said lines, and providing that compensation be paid to the said Corporation for the use thereof by the said companies or persons, and for an Order abrogating any right possessed, or enjoyed by any such company or person to carry lines for the transmission of electricity on poles on any of the said highways, or parts of highways, under any Act or Municipal By-law, License or Agreement, and states:—

1. That the said Corporation is the Municipal Corporation of the City of Ottawa, having the control of and jurisdiction over the said highways and parts of highways.

2. That it is necessary and expedient, for the protection of life and property and for the convenience of the public, that the use of overhead lines for the transmission of electricity upon the said highways and parts of highways should be discontinued.

3. That the following Companies or Corporations have overhead lines for the transmission of electricity on the said highways and parts of highways, that is to say:—

The Great North Western Telegraph Company,

The Ottawa Electric Railway Company,

The Canadian Pacific Railway Telegraph Company,

The Ottawa Electric Company,

The Bell Telephone Company,

The Corporation of the City of Ottawa.

Dated this first day of June, A.D. 1912.

(Signed) TAYLOR McVEITY,

Solicitor for the Corporation of the
City of Ottawa.

Joint Application of the City of Hamilton

THE BOARD OF RAILWAY COMMISSIONERS FOR CANADA

and

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

The Corporation of the City of Hamilton, pursuant to *The Power Commission Act of 1912*, hereby applies to "The Board of Railway Commissioners for Canada" and "The Hydro-Electric Power Commission of Ontario," for an Order directing the Hamilton Electric Light and Cataract Power Company, Limited, and The Hamilton Cataract Power, Light and Traction Company, Limited, to remove their poles, wires and cables from the following portions of streets in the City of Hamilton, namely:—

Catharine Street, from Jackson Street to Rebecca Street;
 John Street, from Hunter Street to Rebecca Street;
 Hughson Street, from Hunter Street to Jackson Street;
 Hughson Street, from King Street to Gore Street;
 James Street, from Herkimer Street to Stuart Street;
 McNab Street, from Main Street to Vine Street;
 Charles Street, from Main Street to King Street;
 Park Street, from Main Street to Merrick Street;
 Bay Street, from Main Street to York Street;
 Jackson Street, from James Street to Catharine Street;
 Main Street, from Bay Street to Catharine Street;
 King Street, from Sophia Street to Wentworth Street;
 York Street, from Bay Street to James Street;
 King William Street, from James Street to Hughson Street;
 Rebecca Street, from James Street to Catharine Street;
 Merrick Street, from James Street to Park Street;

as shown on the map or plan prepared by E. J. Sifton, Consulting Engineer of "The Hydro-Electric Department" of the Corporation of the City of Hamilton, and directing that the said lines, wires and cables of the Company be placed and carried in underground conduits.

The Corporation of the City of Hamilton states as follows:—

1. That the above named portions of the streets are situated in that part of the City where the traffic upon the City highways is very great; that the maintenance of the poles, wires and cables upon said portions of streets, interferes with such traffic and is dangerous to the members of the Fire Department and incommodes such members in case of fire, and renders the appearance of such portion of streets unsightly, and it is necessary and expedient for the protection of life and property and for the convenience, safety and welfare of the public, that the use of all overhead lines upon the said portions of highways should be discontinued.

2. That poles, wires and cables of the following companies, namely:—

The Bell Telephone Company of Canada,
 The Great North Western Telegraph Company of Canada,
 The Canadian Pacific Railway Company's Telegraph,

are also maintained on the said portion of streets, or certain parts thereof.

3. The Corporation of the City of Hamilton has entered into an agreement with the Hydro-Electric Power Commission of Ontario for the supply of electric power to the City Corporation, and on the 14th day of August, 1911, the Corporation of the City of Hamilton passed By-law No. 1,165 to provide for the issue of debentures to the amount of \$505,160 for the cost of a plant to distribute electric energy and light, the power therefor to be supplied by "The Hydro-Electric Power Commission of Ontario,"

and the estimates of the intended expenditure, for the complete works, plant, machinery and appliances for the operation of street lighting, commercial lighting and residence lighting, and power requirements, as set forth in said by-law, are as follows:—

Conduit (underground) service	\$95,373 00
Estimated cost of service for same	3,200 00
Cables, drawing and splicing	48,980 00
Primary wood pole distribution	29,994 00
Sub-station and equipment	54,450 00
Line transformers	14,500 00
Meters	15,750 00
High-tension interswitching station	5,300 00
Concrete distribution poles and lights	99,540 00
Iron 5-light ornamental Tungsten standards	30,000 00
Iron 1-light ornamental Tungsten standards	6,220 00
Establishment expenses	62,350 00
Secondary wiring and street lights	26,544 00
Secondary wiring, residence lights	8,000 00
Secondary power service lines	3,675 00
	<hr/>
	\$503,878 00

4. The City Corporation contemplates placing and carrying the lines, wires and cables of its power and lighting systems upon those portions of streets before mentioned in underground conduits.

5. Contemporaneously with this application, applications will be made to "The Board of Railway Commissioners for Canada," for similar orders respecting the poles, wires and cables of "The Bell Telephone Company of Canada" and "The Great North Western Company," and "The Canadian Pacific Railway Company's Telegraph" before mentioned.

Dated at the City of Hamilton this 25th day of April, 1912.

(Signed) F. R. WADDELL,

Solicitor for the Corporation of the
City of Hamilton.

CHAPTER II

TRANSMISSION SYSTEM

STATIONS

Niagara System

Niagara Falls Transformer Station (No. 1)

The Canadian Westinghouse Company is installing out-door 110,000 volt line oil switches to operate in conjunction with the line oil switches originally furnished on its contract. These circuit breakers are provided with resistances across their terminals and are so arranged to open an instant before the opening of the breakers inside the station. The installation of this apparatus will improve the service. Some modifications in the 110,000 volt hood construction was required to protect this out-door equipment from the weather.

Construction is now under way on the permanent arrangement of water resistances which connect the neutrals of the main transformer banks to "Ground."

Owing to the fact that the cooling water required for the transformers, which has heretofore been purchased from the Corporation of the City of Niagara Falls, with a connection with the Ontario Power Company for emergency use, has entailed considerable expense, further experiments were made towards procuring additional water on the Commission's site, with the result that a well was sunk and pumping equipment provided. At the present time this well with the aid of the sprinkling tank provides sufficient water without relying on the City or the Ontario Power Company. There still is, however, connection with both these other sources for emergency use.

In order to facilitate the shifting of the transformers from one pocket to another in case of emergency it was considered advisable to purchase a duplicate transfer truck. The new truck is fitted with roller bearings, and with it the transformers can be handled more expeditiously.

Tenders were called for the supply and erection of an additional bank of three 3,000 kv-a. transformers and a spare unit with the requisite 12,000 volt and 110,000 volt switching equipment. Proposals were received from the Canadian General Electric Company, Siemens Company of Canada and the Canadian Westinghouse Company. After careful consideration of each tender, the contract for the equipment was awarded to the Canadian Westinghouse Company. According to the terms of the contract this apparatus will be installed before the end of the present calendar year. The equipment will be similar to that originally furnished by this Company with the exception that some improved features of design are embodied. These improvements are the result of two years' operation of the apparatus originally installed.

For the purpose of supplying power to the additional transformers it was necessary that an additional feeder consisting of two three-conductor 300,000 c.m. 12,000 volt cables be provided connecting the station with that of the Ontario Power Company. Specifications were sent to different cable manufacturers in America as well as in Europe. The contract was awarded to the Canadian British Insulated Company, the price including the drawing of the cables into the conduit. The cable has arrived at Niagara Falls and the contractor's workmen are at the present time engaged installing it.

Dundas Transformer Station (No. 2)

In order to take care of the increased number of municipalities being supplied from this station, it was decided to provide additional outgoing 13,200 volt feeders as well as to increase the transformer capacity. Tenders were called for equipment required for four additional feeders and switching equipment for an additional bank of transformers. The Canadian Westinghouse Company will supply and erect the 13,200 volt transformer and feeder switching equipment as well as the requisite 110,000 volt switching apparatus, whereas the Siemens Company of Canada will supply the protective equipment for the four feeders, the latter to be installed by the Commission. As the installation of portions of this equipment will be more or less hampered by the operation of the station it was considered advisable to install the portions most affected by the construction force.

Upon investigation it was found possible to install the six 1,250 kv-a. transformers which are being removed from Toronto station in Dundas station with slight alterations to transformer supporting structures, so it was decided that these transformers would be transferred. The transfer of this apparatus will be affected by the Canadian General Electric Company who originally installed them in Toronto station. It is the intention to move the four 750 kv-a. transformers at present at Dundas station to Brant station this coming winter.

It was necessary to purchase an additional transfer truck for this station as that at present in use is not suitable for the transformers being brought from Toronto. The original truck, however, may be transferred to Brant Station with the transformers.

The installation of the resistance for the transformer neutral is being carried on concurrently with the other construction work.

An emergency 13,000 volt bus is being provided whereby, with the aid of disconnecting switches, it will be possible in case both banks of transformers should become disabled or should it be necessary, due to some unforeseen condition, to remove the transformers, to supply power to any or all of the 13,200 volt feeders served, from Guelph, Port Credit or Brant transformer stations.

A portion of the erection room area in this station has been partitioned off and a two-storey office has been provided for operating officials and to provide more room for the system operator, arrangements are at present being made to enlarge the control room.

City of Hamilton

Plans which were prepared by the local power department for their Trolley Street sub-station were considered and approved. A study is being made of and sketches being prepared for a combined transformer and switching station for the City to be located near the corner of Head and Sophio Streets.

Provincial Hamilton Asylum

A recording wattmeter has been installed in the transformer station of the Hamilton Asylum in the City of Hamilton for measuring the power consumption.

Town of Dundas

Three transformers purchased for the Town of Dundas were temporarily installed in the transformer station to replace those purchased last year which had proven unsatisfactory. These are at the present time being permanently installed, the work being carried on in conjunction with the installation of the additional feeder equipment.

Specifications were prepared and tenders called for the equipment required for a transformer station for the John Bertram Co., and a report on the tenders received, submitted to the Bertram Company. The Town supplies this Company with power at 13,200 volts, and it is transformed to 575 volts for distribution around their plant.



Low Tension Switches, Toronto Station

Waterdown Distributing Station

The installation of equipment has been completed in the distributing station at the plant of the Dominion Sewer Pipe Co. near Waterdown. This station is equipped with three 75 kv-a. transformers and supplies power to the Village of Waterdown as well as to the Dominion Sewer Pipe Company. Owing to the fact that the latter is increasing its power demand, arrangements are being made to provide separate feeder panels for the Company and the Village.

Caledonia Distributing Station

A station equipped with three 150 kv-a. transformers and two 2,300 volt feeders was constructed in the Village of Caledonia. The building was constructed by local contractors. The switching and protective equipment was supplied by the Canadian Westinghouse Company and the transformers by the Pittsburg Transformer Company, through their Canadian agents, the Construction Supply Company. Power is supplied from this station over one feeder to the Alabastine Co., Ltd. and over the other to the Village. The site, building and equipment are all the property of the Commission.

Crown Gypsum Company

A recording wattmeter was installed at the plant of the Crown Gypsum Company, at Lythmore, for metering power which is supplied to the company at 13,200 volts. The transformers, switching and protective equipment for the station were supplied by the Company, preliminary drawings showing the arrangement of apparatus having been in general approved by the Commission.

Toronto Transformer Station (No. 3)

As the Toronto Electric Commissioners expected that the load on this station by the end of the present calendar year would be considerably in excess of the original capacity of the station, tenders were requested for seven single phase, 2,500 kv-a. transformers, it being the intention to install six in the space at present occupied by six 1,250 kv-a. units, to install the seventh as a spare unit, and to remove the present transformers to Dundas Station. The Canadian General Electric Company was awarded the contract for the supply and installation of the seven transformers as well as changes in switching equipment and wiring required on account of the increased capacity. The installation of this equipment is now in progress and unless unforeseen conditions will be completed in time to take care of the winter peak.

London Transformer Station (No. 4)

No additions were made at the station.

London Provincial Asylum

The installation of equipment purchased last year for the Department of Public Works was completed and the station placed in service. This equipment covered transformer station equipment consisting of three 75 kv-a. transformers, 13,200 and 575 volt switching and protective equipment.

Guelph Transformer Station (No. 5)

The installation of the 13,200 volt feeder equipment for supplying the Ontario Agricultural College was completed and placed in service in the spring of 1912.

Ontario Agricultural College

The installation of apparatus purchased last year was completed, as well as some minor additional equipment which was required by the College authorities.

Central Prison Farm

Specifications were prepared and tenders called for the supply of equipment necessary for a temporary sub-station for the Central Prison Farm, capable of delivering 75 kv-a. These specifications are now in the hands of the manufacturers, and as soon as the equipment is received the installation of same will be carried on by the construction force at the expense of the Prison Farm.

Acton Distributing Station

A contract was awarded for the construction of a distributing station building in the Village of Acton, on a site provided by the Village. The equipment purchased from Siemens Company of Canada and intended for Baden has been shipped to Acton, and installation of same will be proceeded with just as soon as the building has been completed. The equipment consists of switching and protective apparatus for one incoming 13,200 volt line, three 75 kv-a. transformers stepping down to 2,300 volts and one feeder panel with indicating and recording meters. The contract for the building was awarded to J. McKenzie, of Acton.

Village of Acton

Tenders were called covering the supply of a constant current street lighting transformer for the Village, this apparatus to be installed in the local station. A letter has been sent to the Village with recommendation.

Preston Transformer Station (No. 6)**Town of Preston**

Specifications were issued covering the supply of three additional transformers with requisite switching equipment for the Corporation's transformer station. Tenders were received and a report made to the Corporation.

Town of Galt

Tenders were obtained on some additional transformer station switching equipment for the local power Commission, also the necessary contracts were prepared, which were signed. This work is now under way and should be completed in a short time.

Specifications were prepared and tenders called for the supply and erection of two 800 Imperial gallon 270 ft. head pumps, direct connected to a 250 kv-a. synchronous motor, as well as piping, switchboard and accessories for the local Water Commission. The necessary contracts were prepared and the work is now under way. The pumps, valves and piping will be supplied by the Canada Foundry Company, the pumps being of Mather and Platt design, and the electrical equipment will be of Swedish General Electric Company manufacture, and supplied through Messrs. Kilmer, Pullen and Burnham, their Canadian representatives. The motor has a capacity considerably in excess of that required for driving the pumps. The extra capacity of the motor will be employed to correct the power factor of the Town's power load.

Berlin Transformer Station (No. 7)

Provision has been made in this station for quickly connecting a spare transformer for service, to replace any transformer in the bank which might become defective. Similar provision will be made in all the line stations in which only one bank of transformers and a spare is provided.

Baden Distributing Station

The Village constructed a building on a site provided by itself from designs furnished by the Commission. In this station three 20 kv-a. Canadian General Electric transformers with necessary switching and protective equipment were installed, the latter being purchased from the Canadian Westinghouse Company. The equipment originally purchased for this station was transferred to the Acton Distributing Station. During the construction of the station, temporary service was given the Village from New Hamburg.



Baden Distributing Station

Stratford Transformer Station (No. 8)

Provision was made inside the station for supplying power over either of the two lines running to the towns of Mitchell and Seaforth from one 13,200 volt oil switch.

Town of Seaforth

The installation of the equipment for the Town's transformer station as well as the construction of the building was inspected and a constant current street lighting transformer was purchased for the Town.

Town of Mitchell

A meter panel containing recording wattmeter and power factor meter was installed in the transformer station of the Town of Mitchell for metering the Town's power consumption.

St. Mary's Transformer Station (No. 9)**St. Mary's Portland Cement Co. Distributing Station**

Specifications were prepared for the supply of three 500 kv-a. single phase, water cooled transformers and necessary switching and protective equipment for supplying the St. Mary's Portland Cement Company with 575 volt power, delivery to the station being made at 13,200 volts. Contracts were awarded for the transformers to the Canadian General Electric Company and the switching and protective apparatus to the Canadian Westinghouse Company. Power is now being supplied to the Company through this station. The Company provided the necessary building, and the Commission the equipment. This company was desirous of obtaining power in advance of the completion of the distributing station and in order that their wishes might be gratified, a temporary installation was made consisting of six 75 kv-a. transformers at the Company's plant and supplied them with power two months in advance of the completion of the station proper.

Woodstock Transformer Station (No. 10)

Only one feeder oil switch was provided for supplying power to Norwich and Tillsonburg and provision was made inside the station for supplying power over either of the two 13,200 volt lines running to these municipalities from the one oil switch.

A small pump was installed in the basement of the station to pump water from the sump.

Town of Tillsonburg

A recording watt-meter was installed in the town's transformer station. The power was originally measured at Woodstock, but as Norwich is supplied over the same lines as Tillsonburg metering apparatus was required in each town.

Norwich Distributing Station

The Village of Norwich constructed a building in accordance with drawings furnished on a site provided by itself for housing the Commission's step-down equipment. The apparatus for this station, the purchase of which was covered by the last report was installed and the station placed in service. The equipment consists of 13,200 volt switching and protective equipment for one incoming line, three 50 kv-a. single-phase self-cooled transformers, which step the voltage down to 2,300 volts, and one three-phase 2,300 volt feeder panel with indicating and recording meters. In the case of villages, power is supplied at 2,300 volts, which necessitates no transformer stations for the villages. In order to supply the village with 2,300 volt power in advance of the completion of the installation of the equipment, a temporary installation of two 20 kv-a. transformers was made at the Woodstock station and power delivered to the village at 2,300 volts over a 13,200 volt line.

Beachville Distributing Station

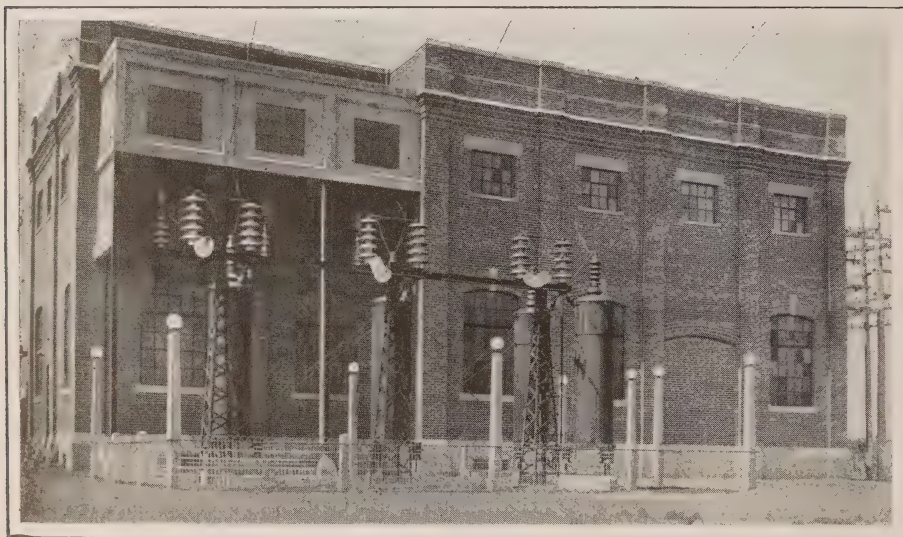
A building was constructed, and equipment identical to that provided at Norwich Distributing Station was installed. During the construction of the building temporary service was supplied from Ingersoll.

St. Thomas Transformer Station (No. 11)

The only additions to the equipment in this station has been a feeder panel and oil switch, also equipment required for supplying two outgoing feeders from one oil switch. Construction work, in the station, on these changes has been started. When this work is completed the lines to Port Stanley and London and Lake Erie Railway and Transportation Company shall each have an oil switch, and the two lines to the Corporation of St. Thomas will be supplied by one oil switch.

Corporation of St. Thomas

Specifications were prepared and tender called for the supply of a motor-driven turbine pump for the local water commission for use in connection with an aerator. The specifications called for a pump capable of delivering 2,100 Imperial gallons per minute against a head of, approximately, 60 feet, and direct connected

**Port Credit Station**

to a 2,200 volt induction motor. The equipment finally purchased consisted of a Canadian Boving Pump and a Lancashire motor. A bank of three 50kv-a. transformers, stepping down from 13,200 to 2,200 volts with requisite switching apparatus was installed in the Transformer Station at St. Thomas. This equipment is the property of the Corporation. The apparatus was purchased from the Canadian General Electric Company, and installed by the construction force.

Port Stanley Distributing Station

The apparatus referred to in the last Annual Report was installed and placed in operation during the year. The equipment is similar to that installed in Norwich Distributing Station.

Corporation of Port Stanley

Tenders were obtained on a motor-driven pumping unit for the local water system. The unit specified consisted of a turbine pump with a capacity of 350

gallons, 260 ft. head, direct connected to a 2,200 volt induction motor. The Canada Foundry Company secured the contract; the pump being of the Mather and Platt type, and the motor being manufactured by the Canadian General Electric Company.

London and Lake Erie Railway and Transportation Company

There were some changes necessary in the equipment of this Company's Power Station at St. Thomas to adapt it to hydro-power the necessary 13,200 volt switching and protective equipment was therefore purchased for the Company. The Commission also purchased for installation in the Company's station a panel containing a recording wattmeter and a wathour meter for measuring the Company's load.



Mimico Distributing Station

Port Credit Transformer Station (No. 13)

There were several details, such as fencing and grading of station site and finishing of floors (which had not been completed during the last fiscal year), attended to during the late fall of 1911. The water system was also completed. The transformer water flows by gravity from a natural basin in a creek about 600 feet from the station to a well from which it is pumped through the transformers. The water is then returned to the well or to the creek as is desired for regulation.

Port Credit Brick Company

A recording wattmeter with 13,200 volt current and potential transformers was installed at the transformer station of this Company in Port Credit.

Corporation of Brampton

The construction of the building and installation of equipment at the Municipal Station was completed. This work was carried on under the direction of this department.

Mimico Distributing Station

A station was built and equipped at New Toronto with a capacity of 225 kv-a. for supplying the Village of Mimico and Mimico Asylum. The site was purchased by the Commission, the contract for building awarded to George Coxhead, a local contractor, and the contract for electrical apparatus awarded to the Canadian General Electric Company. This station is provided with two complete 2,300 volt feeder equipments.

Port Credit Distributing Station

A station was constructed in the Village of Port Credit and equipment similar to that at Mimico Distributing Station installed. The building was constructed with two rooms, one to house the Commission's apparatus and the other for Municipal uses. The village paid one half the cost of the building.

Cooksville Distributing Station

Two 20 kv-a. single phase transformers stepping down from 13,200 to 2,300 volts for distributing in Cooksville and the vicinity were installed in the Port credit station. By the use of this equipment it was possible to supply power to the Villages of Mimico and Port Credit in advance of the completion of the stations at these two points.

Corporation of Milton

Tenders were called covering three 250 kv-a. transformers with requisite switching and protective equipment for the town's step-down station. Tenders have been submitted to the Corporation with recommendations. As soon as these are acted upon contracts will be placed.

Brant Transformer Station

Specifications were drawn up and tenders called covering the 110,000 and 13,200 volt switching and protective equipment for a proposed new station to supply Brantford, Paris, and the surrounding country.

Drawings and specifications were also prepared for the building required. These were sent out to different contractors in Brantford and Paris and tenders requested.

Severn System

Penetanguishene Distributing Station

The contracts for building and equipment referred to in the last report were completed and the station placed in service. The Town of Penetanguishene has installed a switchboard in the station for their distribution system.

Corporation of Penetanguishene

The motor driven turbine pump which was ordered last year on recommendation, tenders having been called, was placed in service.

Midland

A recording wattmeter was installed in the Midland Transformer Station of the Simcoe Railway and Power Company for metering the power used by the town.

The motor driven turbine pump ordered by the town last year, on recommendation, was placed in service.

Barrie Distributing Station

Equipment has been ordered for stepping down from 22,000 volts, 3 phase to 2,300 volts, 2 phase, for supplying to Town of Barrie. The apparatus consists of two 350 kv-a. single phase transformers and 22,000 volt switching and protective devices. The power will be measured here at 2,300 volts. The tenders for equipment for this station, as well as that required for Collingwood and Coldwater stations, were obtained. The Canadian General Electric Company will supply transformers and switching apparatus for the three stations, and Siemens Company of Canada the protective equipment. The present power station of the Town of Barrie will be used to house the equipment.

Corporation of Barrie

The contract for distributing station equipment was made to include potential regulators and power and lighting feeder panels for the town. The town will pay for this equipment.

Specifications are at present in course of preparation for motor driven pump equipment for the town, this to include pumps for domestic as well as fire service.

Collingwood Distributing Station

Three 250 kv-a. transformers to step the voltage from 22,000 volts, 3 phase to 2,300 volts, 3 phase, have been ordered, also 22,000 volt switching and protective equipment. A building large enough to house the Commission's apparatus, as well as the distribution equipment for the town, is being constructed by H. G. Wynes, a local contractor.

Corporation of Collingwood

The contract for apparatus for this station also includes potential regulators. These are to be purchased by the town.

Specifications are in course of preparation for motor driven pumping equipment for the town.

Coldwater Distributing Station

The equipment ordered for their station consists of three 75 kv-a. transformers stepping down from 22,000 volts, 3 phase to 2,300 volts, 3 phase, as well as the full complement of switching and protective devices. The building necessary to house the equipment is being constructed by J. Sawyer, a local contractor.

Elmvale Distributing Station

The specifications for equipment and a building for Elmvale have been prepared. The building and equipment will be similar to that at Coldwater.

Port Arthur System

Port Arthur Station

The water cooling system at this station has been augmented by an additional pump. This was considered necessary because of the increased capacity of the station.

The Corporation of Port Arthur was granted the right to install in the Commission's station a 750 k.w. motor generator set, for operating the local street railway; this set being a duplicate of the one already in service.

General

Storehouse and Testing Laboratory

It was decided during the year to construct a storehouse, testing laboratory and garage combined, on Garrison Commons adjacent to Transformer Station. Accordingly the necessary drawings and specifications were prepared and tenders called for the construction of the building. The general contract was awarded to Messrs. Witchall & Son, who submitted the most advantageous tender, and the building is now well under way. It is the intention, however, to carry on this work as expeditiously as possible, so that it will be possible to occupy the building during the coming winter.

A 300,000 volt transformer purchased some time ago for testing purposes will be permanently installed in this laboratory.

In addition a contract was awarded to the Canadian Westinghouse Company for the supply of a transformer testing set, consisting of a transformer and regulator by which voltages from 1,000 to 75,000 can be obtained.

Machine Shop

A machine shop has been established in the basement of the Toronto Transformer station for development work and repairs. In this department switchboard fittings and miscellaneous station construction material is manufactured. A small stock of such material is kept for emergency use.

Grounding Switches

For the purpose of grounding 110,000 volt lines when they are cut out of service for repairs, grounding switches were installed in each of the transformer stations. These switches are easy to operate, and will be employed when required.

Parliament Buildings

At the request of the Department of Public Works specifications were prepared for two synchronous motors each direct connected to a 125 kw. direct current generator with switching equipment, also three 50 kv-a. transformers. The motor generators will be used for obtaining direct current power for the operation of the elevators, which are already installed and equipped with direct current motors. The transformers are to be used for stepping the voltage down from 2,200 volts as received from the Toronto-Hydro Electric System to 110/220 volts for lighting the Parliament Buildings. Tenders were called and when these were received they were considered and a report made to the Department of Public Works. The contract was awarded for the entire equipment to Messrs. Kilmer, Pullen and Burnham. A portion of the material is on the ground and the contractors promise to commence installation work immediately.

Standards

In order to expedite the purchase of equipment, standard specifications for such apparatus as possible were prepared. These cover transformers of both station and pole types for all voltages from 2,200 up to 30,000. Three phase motor specifications were also issued and work is well advanced in the standardization of building and pole line details.

Lightning Protection

Considerable trouble has been experienced by the use of certain types of lightning arresters which have been installed in different parts of the system. Investigations have been made, experiments performed and as a result designs for a 13,200 volt arrester have been prepared from which one will be constructed and tried out in the system.

Service Transformers

An engineer visited the works of different transformer manufacturers in Canada and in the United States for the purpose of investigating and inspecting their methods of manufacture. A report was made dealing with the detailed construction of each type. This report will, no doubt, prove valuable in the purchase of transformers for distribution purposes.

WOOD POLE TRANSMISSION LINES.

General

During the past year approximately 160 miles of wood pole lines were built. These constructions necessitated the employment of an average of six gangs of

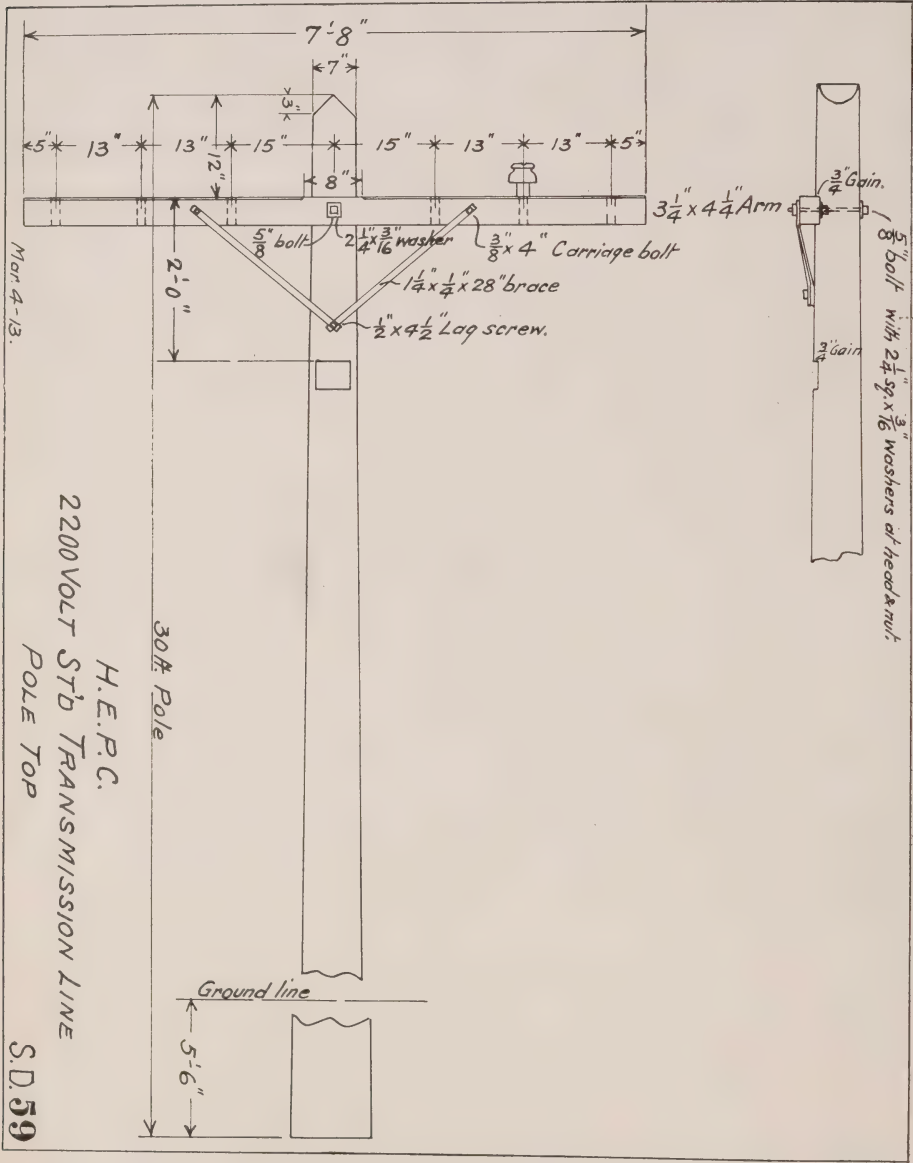


Diagram of 2,200 Volt Pole Top

men, each consisting of a foreman, time-keeper and from fifteen to twenty hands. The Construction Department also located the lines, surveyed private right of way and superintended the construction of these lines.

volt, 13,200 volt and 22,000 pole tops. The construction employed is generally as follows:—for 2,200 volt distributing lines 30 ft. native cedar poles, with 4 or 6 pin cross arms, locust top pins, porcelain insulators, and bare or D.B.W.P. copper wire; for 13,200 volt lines 40 ft. Idaho Cedar poles, with 4 and 2 pin Georgia

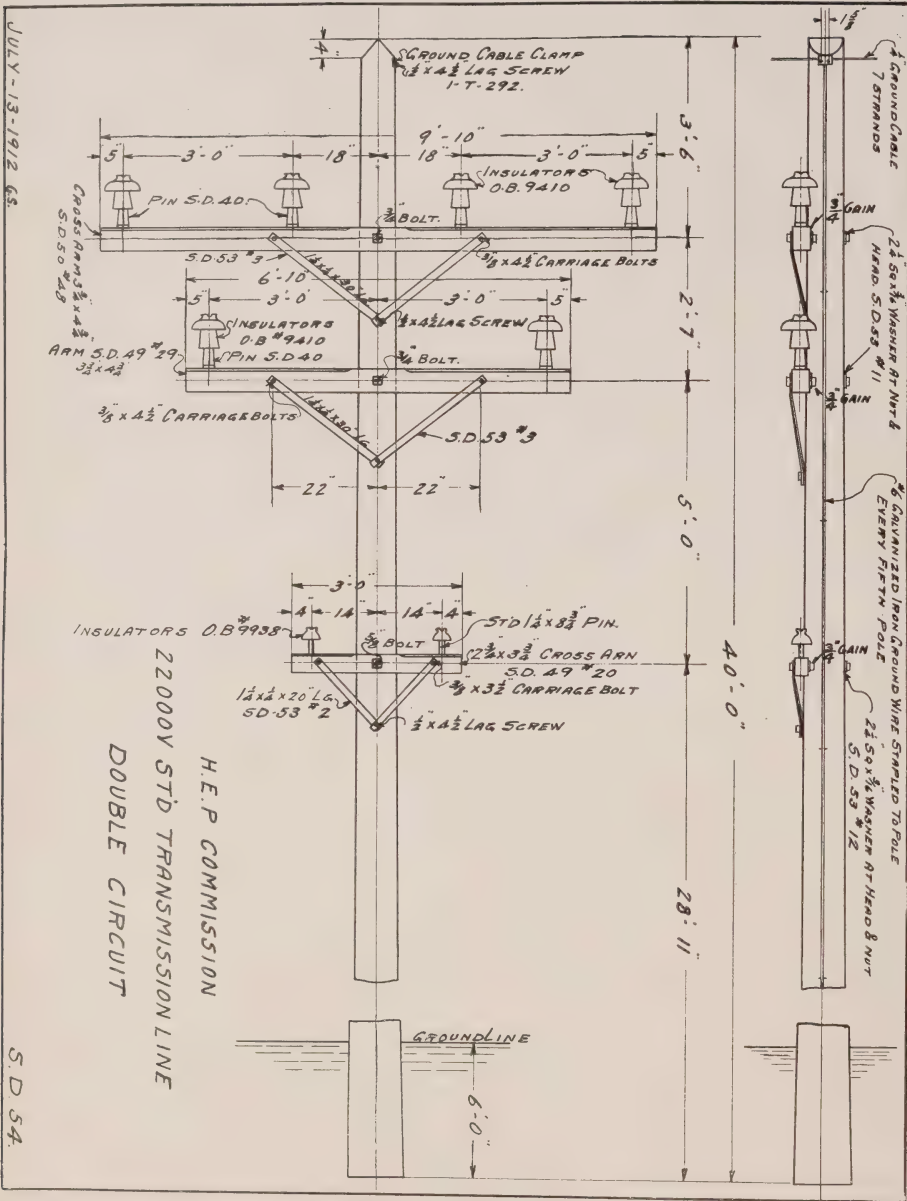


Diagram of 22,000 Volt Pole Top

pine power cross arms, locust top pins, porcelain insulators, aluminum power cables, 1/4 in. 7 strand galvanized steel ground cable erected on pole tops with ground cable clamps and a copper-clad steel telephone circuit carried on a two-pin cross arm.

Pole butts were treated to a brush coat of wood preservative to a height of 8 ft. from the bottom; cross arms were dipped in hot wood preservative and all hardware was galvanized.

Description of Lines

During the year construction work was started on approximately 160 miles of low tension lines, consisting of 75 miles 13,200 volt line extension to the Niagara System; 23 miles of 26,400 volt line from Morrisburg to Prescott, and 62 miles of 22,000 volt line from the Simcoe Railway and Power Company at Waubauskene, Ont., to the Municipalities of Barrie, Collingwood, Coldwater and Elmvale. The mileage of the various lines completed and under construction on Oct. 31, 1912, is as follows:—

Total Mileages of Lines

	Totals June, 1910, to Oct. 1911	Totals Oct. 31, 1911, to Oct. 31, 1912	Totals to Oct. 31, 1912
Total mileage of low tension lines.....	185.69	158.89	344.58
Total mileage of single circuit lines.....	66.46	158.89	225.35
Total mileage of double circuit lines	119.23	none	119.23
Total mileage of low tension telephone lines....	171.29	154.19	325.48
Total mileage of lines completed.....	173.17	50.99	236.68
Total mileage of line under construction.....	23.07	107.90	107.90
Total number of poles	8,256	7,222	15,478

The mileage of the lines tabulated according to the voltage of the circuits is as follows:—

Voltage	Single Circuit Totals				Double Circuit Totals				Totals			
	Oct. 31, 1911	Oct. 31, 1911 to Oct. 31, 1912	Oct. 31, 1912		Oct. 31, 1911	Oct. 31, 1911 to Oct. 31, 1912	Oct. 31, 1912		Oct. 31, 1911	Oct. 31, 1911 to Oct. 31, 1912	Oct. 31, 1912	
22,000.....	4.50	88.59	93.09	.....	.....	.....	.....	.....	4.50	88.59	93.09	.....
13,200.....	56.46	63.90	120.36	112.92	.....	112.92	169.38	63.90	233.28			
6,600.....	4.52	.....	4.52	5.79	.....	5.79	10.31	.....	10.31			
2,200.....	1.98	6.40	8.38	.52	.....	.52	2.50	6.40	8.90			

Gauge, Length and Weight of Cable and Wire
POWER LINES

Brown and Sharpe Gauge	Wire Miles		Weight Pounds			Miles Single Circuit		Miles Double Circuit	
	To Oct. 31st, 1911	Oct. 31st, 1911, to Oct. 31st, 1912	Total	To Oct. 31st, 1911	Oct. 31st, 1911, to Oct. 31st, 1912	Total	To Oct. 31st, 1911	Oct. 31st, 1911 to Oct. 31st, 1912	Total
400,000 c.m. Alum. Cable	2.29	.....	2.29	4,406	.....	4,406	.53	.....	.53
No. 4/0 Aluminum Cable	36.47	71.91	108.38	37,491	77,734	115,225	.....	23.97	23.97
No. 3/0 ,,	22.86	233.04	255.90	5,852	200,259	206,111	7.26	77.68	84.94
No. 2 0 ,, .....	.....	41.25	41.25	.....	28,132	28,132	.....	13.75	13.75
No. 1/0 ,,	305.51	9.84	315.35	156,726	5,290	162,016	9.41	3.28	12.69
No. 2 ,,	586.52	114.42	700.98	189,445	38,712	228,157	47.94	38.14	86.08
250,000 c.m. D.B.W.P. Copper Cable..	1.95	.....	1.95	8,855	.....	8,855	.45	.....	.45
No. 2/0 D.B.W.P. Copper Cable.....	.....	.66	.66	.....	1,518	1,518	.....	.22	.22
No. 2 Bare Copper Wire	5.89	.....	5.89	6,267	.....	6,267	1.87	.....	1.87
No. 4 D.B.W.P. Copper Wire.....	3.27	.90	4.17	2,517	693	3,210	.....	.30	.30
No. 6 ,, .....	.....	8.10	8.10	.....	4,106	4,106	.....	2.70	2.70
Totals.....	964.76	480.12	1,444.88	4,115.59	3,564.44	7,680.03	67.46	160.04	227.50
									119.23

Gauge Length and Weight of Copper Clad Steel Wire
LOW TENSION TELEPHONE LINES

	Wire Miles		Weight Pounds		Mileage Single Circuit	
	To Oct. 31st, 1911	Oct. 31st, 1911, to Oct. 31st, 1912	Total	To Oct. 31st, 1911	Oct. 31st, 1911, to Oct. 31st, 1912	Total
Brown & Sharpe Gauge						
No. 10	277.32	176.96	450.28	42,707	27,903	70,610
No. 8	82.83	146.52	229.35	20,293	36,712	57,005
Totals	360.15	323.48	679.63	63,000	64,615	107,615
				171.29	161.74	333.03
				132.06	88.48	220.54
				39.23	73.26	112.49

Description of Lines

Niagara System

Sec. No.	From	To	Miles	No. Poles	Voltage	No. Circuits	B. & S. Gauge Cable	Telephone B.&S. Gauge	Work Started	Work Completed	In Operation
1	Dundas Sub. H.E.P.C.	Junction Pole No. 134.	2.84	134	13,200	2	No. 0 Alum	10	July 13, 1910	Jan. 2, 1911	
2	Junction Pole No. 134.	Beach Pump House.	6.34	323	"	2	0 "	10	July 13 "	Jan. 2 "	
3	" " No. 134.	Asylum	1.13	67	"	1	2 "	10	Dec. 5 "	Feb. 8 "	
4	Berlin Sub. H.E.P.C.	Junction Pole No. 10.	.17	10	"	2	0 "	10	Aug. 25 "	Sep. 11, 1910	
5	Junction Pole No. 10.	Waterloo	1.64	79	"	2	0 "	10	Sep. 11 "	Nov. 25 "	
6	" " " "	Berlin Cor. Station	.38	35	"	2	0 "	10	Aug. 25 "	Sep. 11 "	
7	Berlin Sub. H.E.P.C.	New Hamburg	2.27	556	"	2	2 "	10	Sep. 11 "	Jan. 2, 1911	
8	" " " "	Ingersoll	9.87	453	"	2	0 "	10	Nov. 14 "	Mar. 28 "	
9	Woodstock	Junction Pole No. 508.	11.12	508	"	2	0 "	10	Jan. 2, 1911	Apr. 1, 1911	
10	Junction Pole No. 508.	Tillsonburg	10.30	467	"	2	0 "	10	Jan. 2 "	Apr. 1, 1911	
11	" " " "	Norwich	4.59	207	"	2	2 "	10	Feb. 13 "	Mar. 30 "	
12	St. Thomas Sub. H.E.P.C.	St. Thomas Cor. Sta.	1.13	50	"	1	0 "	10	Dec. 14, 1910	Dec. 30, 1910	
13	Stratford	" "	1.73	78	"	1	2 Copper	10	Built by Corporation		
14	Preston Sub. H.E.P.C.	Junction Pole No. 99.	2.04	99	6,600	3	2-4/o A.	10	Oct. 8, 1910	Jan. 19, 1911	
15	Junction Pole No. 99	Hespeler	2.08	99	"	1	1-2 Al.	10	Oct. 8 "	Dec. 30 "	
16	" " No. 99	Galt	3.75	175	"	2	2 Alum.	10	Oct. 8 "	Jan. 19 "	
17	Preston Sub. H.E.P.C.	Preston Cor. Station.	.14	11	"	1	4/o "	10	Built by Corporation		
		These poles also carry G.P. & H. Ry. Circuit Sec. No. 35.					2 Copper	10			
18	London Sub. H.E.P.C.	Junct. No 1, Pole No. 38	.79	38	13,200	2	1-3/o Al.	10	Oct. 26, 1910	Jan. 10, 1911	
19	Junct. No. 1, Pole No. 38	Asylum	1.54	70	"	1	1-2 Alum	10	Oct. 26 "	Jan. 19 "	
20	" " " "	Junct. No. 2 Pole No. 93	1.20	55	"	1	3/o "	10	Oct. 24 "	Jan. 21 "	
21	London Sub. H.E.P.C.	London Sub. No. 1	3.56	178	"	1	3/o "	10	Oct. 20 "	Jan. 10 "	
22	Junct. No 2, Pole No. 93	" " No. 1	1.71	96	"	2	{ 3/o "	10	Dec. 23 "	Jan. 10 "	
23	" " " "	" " No. 2	.31	20	"	1	{ 1/o "	10	Dec. 23 "	Jan. 10 "	
24	London Sub. No. 1	Springbank	3.55	156	"	1	0 "	10	Jan. 1, 1911	Jan. 7 "	
25	Dundas Sub. H.E.P.C.	Dundas Town	.98	58	2,200	1	(400,000 c.m. Alum)	10	Dec. 1, 1910	Jan. 1 "	
26	Pt. Credit Sub. H.E.P.C.	Pt. Credit, Lake Shore Rd.	2.74	129	13,200	2	(250,000 c.m. Copper)	10	Feb. 24, 1911	July 10, 1911	
26a	" " Lake Shore Rd.	Pt. Credit Brick Wks.	.24	14	"	2	No. 2 Alum.	10	Apr. 5 "	July 23 "	
27	" " Sub. H.E.P.C.	Brampton	11.29	510	"	2	2 "	10	Feb. 15 "	May 6 "	
28	Stratford	Junct. Pole No. 648.	14.39	648	"	2	2 "	10	Apr. 6 "	Aug. 14 "	
29	Junct. Pole No. 648	Line carried on Stratford City poles	from No. 581		2 to 24	incl.,	erected by	Corporation	Stratford.		
30	" " No. 648	Seaforth	12.86	581	"	2	2 "	10	Mar. 25, 1911	Sept. 13 "	
		Mitchell	1.27	63	"	2	2 "	10	Mar. 24 "	Aug. 3 "	

31	Guelph Sub. H.E.P.C.	O. A. College.	1.58 .09	77	on Station	550 D.C. 2,200 A.C. 13,200 A.C.	1	0	10	July 21,	Sept. 29, 1911
32	Guelph Sub. Sta. Prop.			8	on Property in all.	27 poles	1	No. 0 Alum.	10	Aug. 7,	Sept. 3, 1911
34	Pt. Credit Sub. H.E.P.C.	Weston	18 Poles carried	551	on Sec.	13,200 6,600	2	2	8	Apr. 19,	July 24,
35	Preston Sub. H.E.P.C.	G.P. & H. Ry.	20	6	from	17 poles	1	Stn. to Pole	No. 89—1.94 miles.)	Mar. 13,	Mar. 21,
36	Pt. Credit Junct. No. 84.	Mimico (New Toronto)	carried	on Sec.	from			Stn. to Pole	No. 10—1.14 miles.)		
37	Midland S. Ry. & Pr.Co.	Penetang	5.75	276	13,200	1	1	2	8	Apr. 26,	Feb. 29, 1912
38	Dundas Sub. H.E.P.C. . .	Dom. Sewer Pipe Wks	4.50	223	22,000	1	1	2	10	June 7,	Dec. 19, 1911
39	Hamilton Asylum P.H.	Hamilton Asylum. . .	7.35	350	13,200	2	2	4 Copper	8	July 21,	Dec. 19, 1911
40	Junct. Pole No. 260 . . .	Waterdown . . . . .	.63	30	2,200	1	1	2 Alum.	8	Sept. 26,	Oct. 27, 1911
40a	Dom. Sewer Pipe Wks. . .	Junct. Pole No. 260 . .	1.50	72	13,200	1	1	2	8	Sept. 30,	Oct. 10, 1911
41	St. Thos. Sub. H.E.P.C.	Port Stanley	1.92	600	“	“	1	2	8	Sept. 30,	Oct. 7, 1911
42	Tap Sec. No. 8 Line at Beachville	Standard White Lime Co.	12.50	600	“	“	1	2	8	Oct. 16,	Mar. 8, 1912
42a	Standard White Lime Kiln, Beachville. . . .	(Line carried on Sec. No. 8 poles from Beachville)	1.00	2	2,200	1	1	2	8	to Pole No. 290	miles.
43	Dundas Sub. H.E.P.C. . .	13,200 V. line supplying Temp. Ingersoll from Wood stock. Jno. Bertram & Sons. (Line carried)	1.25	10	Connection. 2,200	1	1	No. 2 Alum.	8	Dec. 6, 1911	Dec. 21, 1911
43a	Dundas Sub.	A. W. Goodes residence	1.70	on Sec.	No. 25 poles	from only.	1	Sub. to pole	No. 58—98	Dec. 1,	Dec. 21, 1911
45	Tap Ingersoll Feeder at Beachville Munic Sub-pole No. 240, Sect. L.T. 8.	Beachville Sub-Sta. . .	.09	3	13,200	1	1	0	8	Dec. 15, 1911	Dec. 19, 1911
46	St. Mary's Sub.	St. Mary's Cement Works.	2.22	80	“	“	1	3/0	8	June 1, 1912	June 29, 1912
47	Dundas Sub.	Caledonia	14.36	674	“	“	1	3/0	8	July 15,	Aug. 19, 1911
47a	Caledonia	Paris Alabastine Mill	.22	Carried on 13,200 Vt. Poles	2,200	1	1	2/0	Nil	May 10,	Sept. 18, 1911
48	Caledonia Sub.	Jct. No. 1, Pole No. 940	5.87	267	13,200	1	1	No. 3/0	8	June 22,	Sept. 18, 1911
49	Jct. No. 1, Pole No. 940	Hagersville	5.00	“	“	“	1	2	10	“	“
50	“	Lythmore	4.98	230	“	“	1	3/0	8	“	“
51	“	Jct. No. 2, Pole No. 940	1.25	60	“	“	1	2/0	8	“	“
52	Jct. No. 2 Pole	Oneida Lime Co. . . .	2.25	“	“	“	1	2/0	8	“	“
53	Jct. No. 2 Pole	Cayuga	3.50	“	“	“	1	2/0	8	“	“
54	Cayuga	Gypsum Mines	4.00	“	“	“	1	2/0	8	“	“

Section 1 to 9, inclusive

Severn System

Under Construction October 31, 1912

Sec. No.	From	To	Miles	No. of Poles	Voltage	No. of Circuits	B. & S. Gauge Cable	Telephone B & S. Gauge	Construction Started	Completed	Remarks
1	Waubashene Junction.	Junc. No. 1, Pole 176.	3.97	176	22,000	1	Alum. No. 4/0	No. 10	Sept. 21, 1912	.....	Under construction, poles erected.
2	Junction No. 1, Pole 176	Coldwater	1.26	61	"	1	No. 2	10	" 23, 1912	.....	Under construction
3	Junction No. 1, Pole 176	Junction No. 2	15.82	712	"	1	No. 4/0	10	" 25, 1912	.....	" "
4	Elmvale	Tap .....	.29	17	"	1	No. 2	10	.....	.....	" "
5	Junction No. 2	Junction No. 3	4.50	207	"	1	No. 4/0	10	Sept. 25, 1912	.....	" "
6	Junction No. 3	Barrie	11.94	556	"	1	No. 2/0	10	.....	.....	" "
7	Junction No. 3	Junction 4	16.00	720	"	1	No. 3/0	10	.....	.....	" "
8	Junction No. 4	Stayner	2.00	.....	.....	.....	.....	.....	.....	.....	.....
9	Junction No. 4	Collingwood	11.25	578	"	1	No. 3/0	No. 10
			67.48								

St. Lawrence System

1	Morrisburg	Prescott	23.00	1,150	22,000	1	No. 3/0	10
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Total Wire Miles, weight of Aluminum Cable, Copper Cable, Copper Wire, Copper Clad Steel Wire and Ground Cable used on lines completed or under construction.

Total Weights and Mileages of Cable and Wire

Cable or Wire	Wire Miles			Weight Pounds		
	To Oct. 31st, 1911	Oct. 31st, 1911 to Oct. 31st, 1912	Total	To Oct. 31st, 1911	Oct. 31st, 1911, to Oct. 31st, 1912	Total
Aluminum Cable	953.65	470.46	142.411	393.920	350.127	744.047
Copper Cable	7.84	.66	8.50	15.122	1.518	16.640
Copper Wire	3.27	9.00	12.27	2.517	4.799	7.316
Copper Clad Steel Wire....	360.15	323.48	683.63	63.000	64.615	127.615
$\frac{1}{4}$ in. Strand " "	184.03	158.89	342.92	134.084	138.240	272.324
Totals.....	1,508.94	962.49	2,471.43	608.643 304 tons	5,592.99 280 tons	11,679.42 584 tons

Progress of Work

In addition to constructing the lines just mentioned, material, labor and superintendence were supplied for the construction of the following distribution systems and extensions.

Baden Distribution System.

Mimico " "

Caledonia " "

Beachville " "

London System Extensions.

Pt. Stanley Distribution System.

Pt. Credit Distribution System and extension in Toronto Township.

Costs

The cost of construction of these pole lines varied owing to the employment of different sizes of conductors necessitated by the different power loads, as well as the different lengths of the various sections. These costs also varied with the distances which material for the line had been teamed, different classes of soil, swamp, sand, etc. Weather conditions for the construction work were also very bad during the season.

The total expenditure on low tension lines from Oct. 31, 1911, to Oct. 31, 1912, was \$158,269.44, making a total expenditure for the construction of low tension lines to Oct. 31, 1912 of \$493,037.99.

CHAPTER III

OPERATION OF THE SYSTEMS

NIAGARA SYSTEM

The operation of the Niagara System has improved considerably during the past year. The service of the Ontario Power Company has been excellent and although their supply was interrupted for a period of one and one-half minutes, and there were several surges, causing synchronous apparatus on the system to fall out of step, the Company has maintained a practically constant voltage, so that their service, on the whole, has been very satisfactory.

The majority of interruptions on the Niagara System were caused by wind storms, although lightning has been responsible for a few. Forty-two different electrical storms were reported during the summer of 1912. Seventeen of these were severe, and the balance either light or moderate. The first lightning storm of the season was observed on April 12th; the last on October 12th. During the seven months in which these storms were reported, there was an average of six days in each month on which storms occurred. Several of these storms were quite general in extent, although in certain parts of the system they occurred more frequently than in others, and were apparently the most severe in the vicinity of Port Credit and the extreme western part of the London Loop.

There have been two total high tension interruptions during the past year, as well as three western loop and one south half western loop interruptions which were caused by lightning. Section "B" of the high tension line supplying the City of Toronto seems to have suffered the least from this cause, the interruptions from lightning totalling $1\frac{1}{2}$ minutes for the whole year. Considering the frequency and the severity of the lightning storms which occurred last summer in the Niagara District and the interruptions on other high tension systems operating in the same vicinity, the system may be considered very fortunate in this respect.

The performance of the suspension insulators on the high tension line has been very satisfactory; only four have failed, two of these being punctured by lightning. Considering that there are one hundred and twenty thousand insulator sections in the system, this service is exceptional.

The post type insulators employed on the high tension lightning arrester towers at the stations have, on the other hand, caused considerable trouble. Several of them have failed, and to guard against a future recurrence of this performance, they are being replaced with an insulator of different design possessing more desirable electrical and mechanical characteristics.

The electrical and mechanical equipment of the high tension stations is in excellent condition and is operating very satisfactorily. This equipment, particularly the lightning arresters and oil switches, has been thoroughly inspected and overhauled by the station maintenance department, and in many cases the lightning arresters have been re-charged with new electrolyte. This equipment will hereafter be regularly inspected once a year to make sure that the interior elements are in good condition. The high tension oil switches were also disassembled, cleaned, and new contacts installed where necessary.

The entire high tension transmission line has been carefully inspected by the line maintenance gang, and the sags of the cable conductors and ground wires

in each of the various sections have been readjusted. At the time these readjustments were made a number of patent connectors in the ground wires, which had proved very unsatisfactory, were replaced by served and soldered joints.

Periodic and systematic patrol inspection of both the high and low tension lines has also been instituted; the routes for the various lines having been chosen with great care, these inspections are now being made at a minimum expense.

A specially designed outdoor type of 110,000-volt oil switch, which is connected in series with the high tension switches inside the building, has just been installed at the Niagara Station. The new switch consists primarily of resistances connected in multiple with the contacts of the switch proper which are so arranged that when the circuit is opened or closed they operate first, and close the control circuit, thereby operating the inside switch and accomplishing the switching operation in two steps. This arrangement protects the inside switch from the severe operating conditions which now exist at the station, and should greatly increase the life of the switch contacts.

An emergency bus is being installed in each of the high tension stations, by means of which a single operator, without help, should be able in case of breakdown, to disconnect a bad transformer and connect a spare in from 15 to 30 minutes.

The outside appearance of all the stations has been improved by grading and seeding the grounds and laying out flower beds and walks. In some cases, the roads leading to the stations, which were in bad condition, have been graded and gravelled.

The following municipalities have been supplied with power during the fiscal year. The table below, as well as the accompanying curves, show the increases in the power loads.

Municipality.	Load in H.P. in Oct., 1911.	Load in H.P. Oct., 1912.	Increases in H.P.
Toronto	3,317.5	13,036.5	9,719.
London	1,608.5	2,681.	1,072.5
Guelph	898.	1,273.5	375.5
Stratford	502.7	643.5	140.8
Mitchell	167.7	221.	53.5
St. Thomas	469.2	643.5	174.3
Woodstock	804.3	837.5	33.2
Ingersoll	201.	496.	295.
Tillsonburg	127.3	194.5	67.2
Berlin	1,045.5	1,226.5	181.
Waterloo	241.3	402.	160.7
New Hamburg	107.	107.	.....
Preston	321.7	643.5	321.8
Galt	335.	643.5	308.5
Hespeler	201.	107.	.....
St. Mary's	241.3	261.	18.7
Dundas	53.6	127.5	73.9
Hamilton	1,307.	2,044.	737.
Hamilton Asylum	75.	87.	12.
Weston	80.4	100.5	20.4
Brampton	20.6	382.	361.4

A list of the municipalities connected to the Niagara System during the past year is given below. In order to provide for this supply approximately 70 miles of 13,200 volt line has been constructed.

Municipality	Date Connected	Initial Load H.P.	Present Load	Increase H.P.
Norwich	April 3, 1912...	60.5	67.	6.5
Seaforth	Dec. 1, 1911...	87.	174.	87.
Waterdown	Nov. 1, 1911...	6.	40.	34.
Ontario Agricultural College ...	Nov. 9, 1911...	120.6	114.	.....
London Asylum	Jan. 24, 1912...	40.6	67.	26.4
Port Stanley	March 9, 1912...	33.5	40.	6.5
Baden	Dec. 29, 1911...	13.5	13.5	.....
Mimico	Mar. 21, 1912...	13.5	50.	36.5
Beachville	June 25, 1912...	13.5	27.	13.5
Port Credit	July 5, 1912...	10.	24.	14.
Caledonia	Sept. 23, 1912...	13.5	13.5	.....

The accompanying curves illustrate the increases in the load of the systems from the beginning of operation to the present time.

It will be seen that for every month last year, with the exception of February, April and August, the load increased. The slight decreases in February and April may be attributed to the longer periods of daylight, and a consequent drop in the lighting load. For a similar reason, the August load includes the smallest consumption of power for lighting purposes. The other curves represent the load delivered from each of the high tension stations to the various municipalities. These curves indicate, even allowing for the natural decrease of the lighting load during the summer months, that the loads of all the municipalities are increasing in a very satisfactory manner, particularly that of the City of Toronto, which has more than doubled in the past year.

CHART SHOWING POWER CONSUMPTION OF MUNICIPALITIES

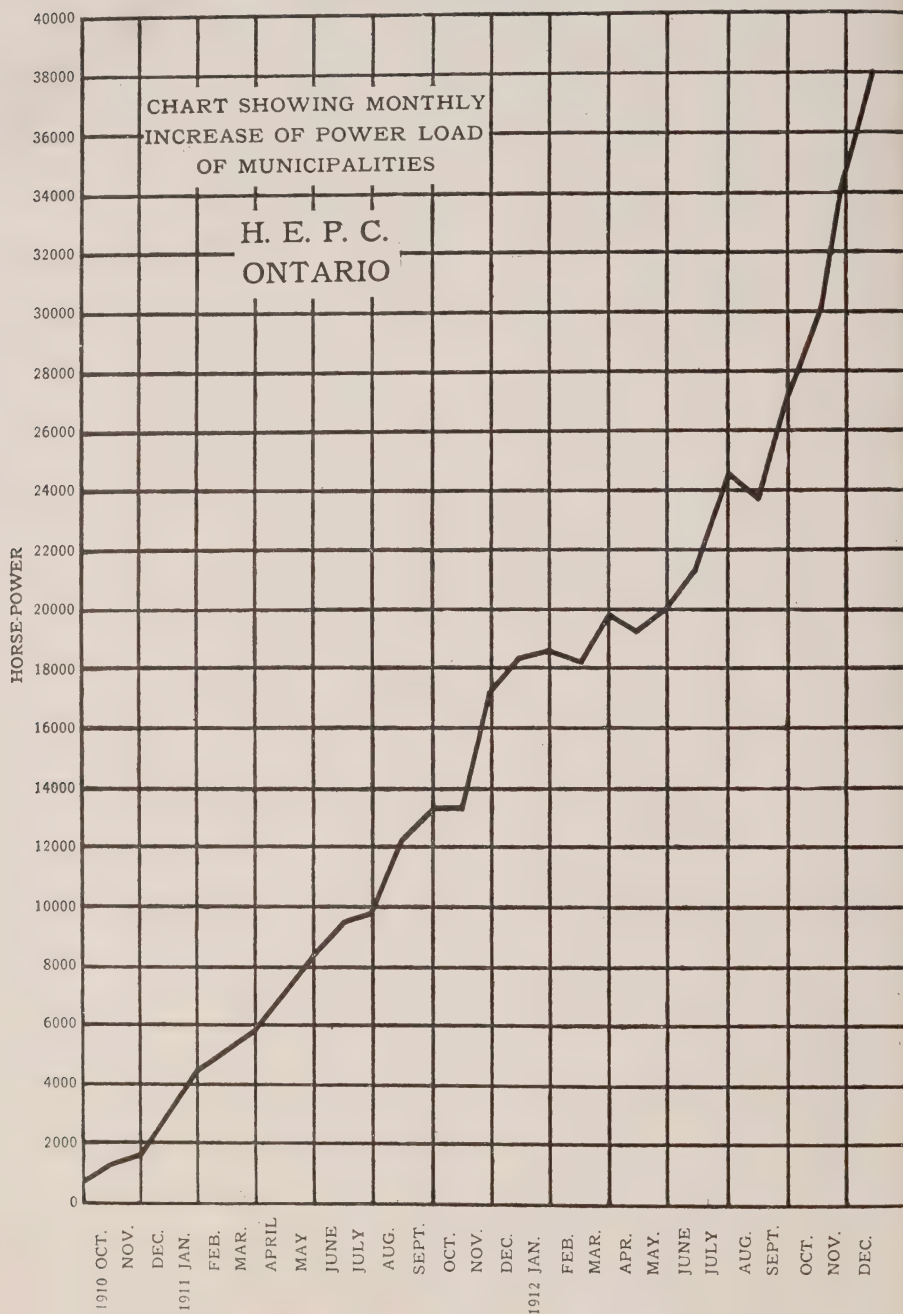


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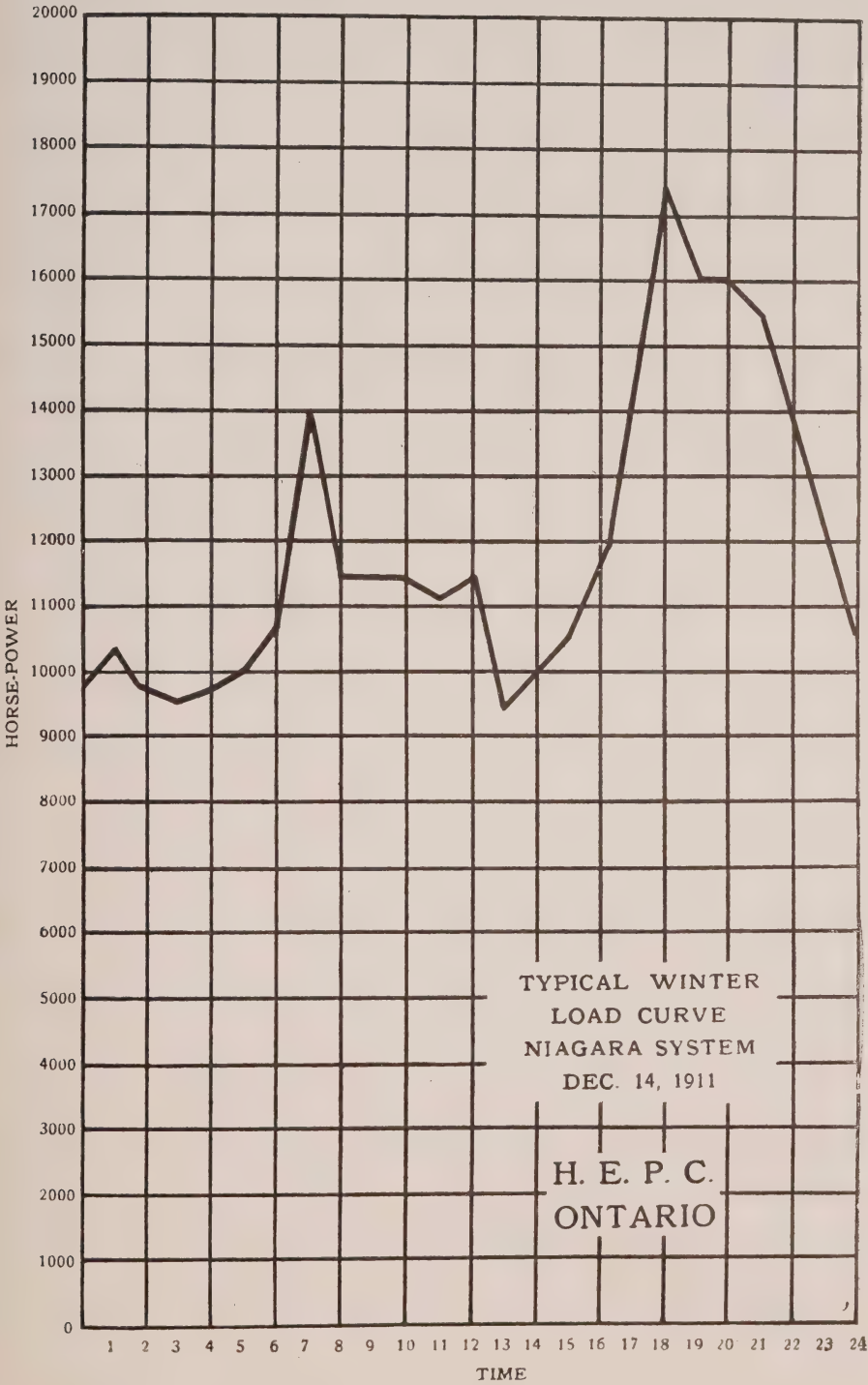


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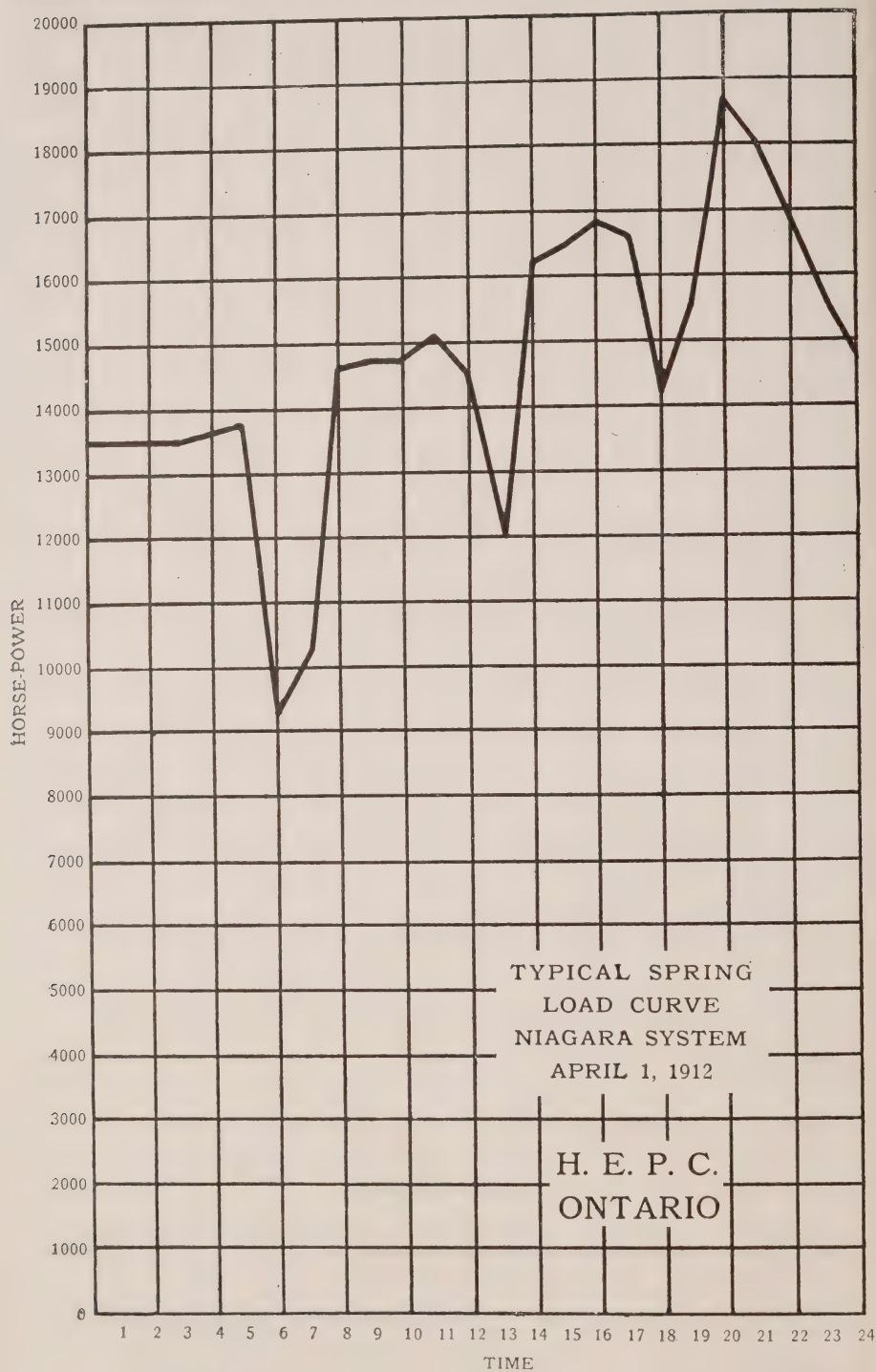


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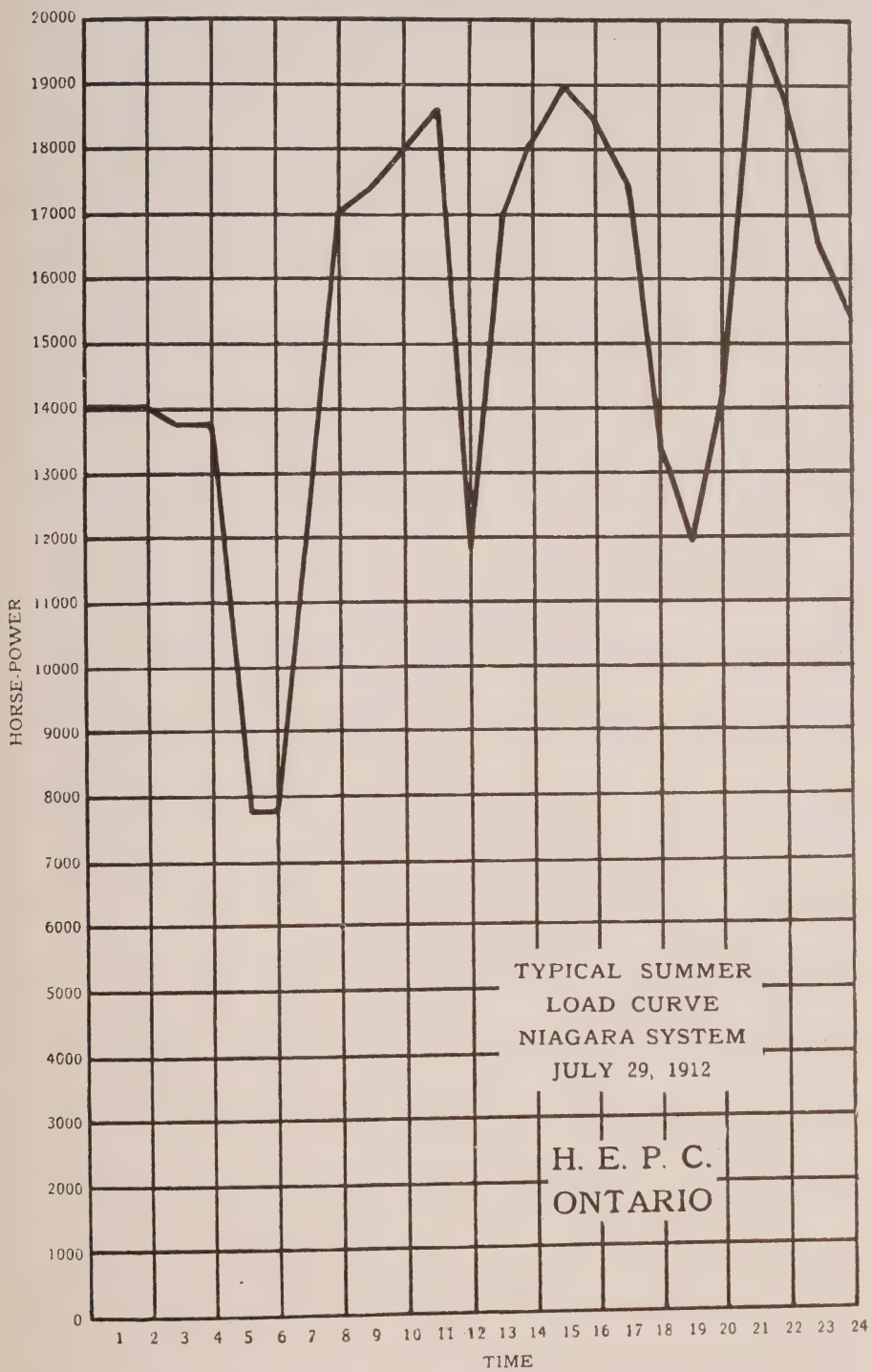


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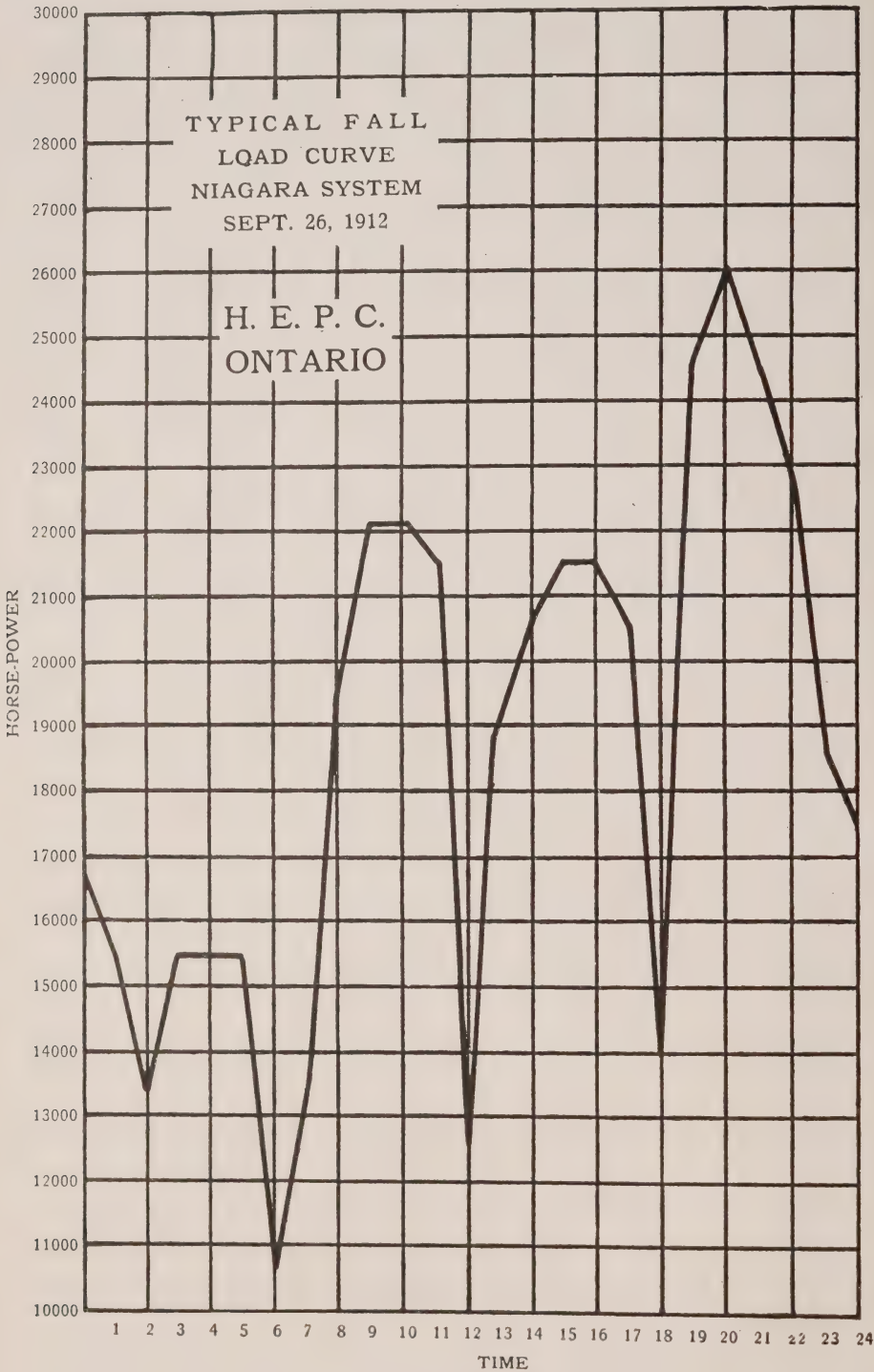


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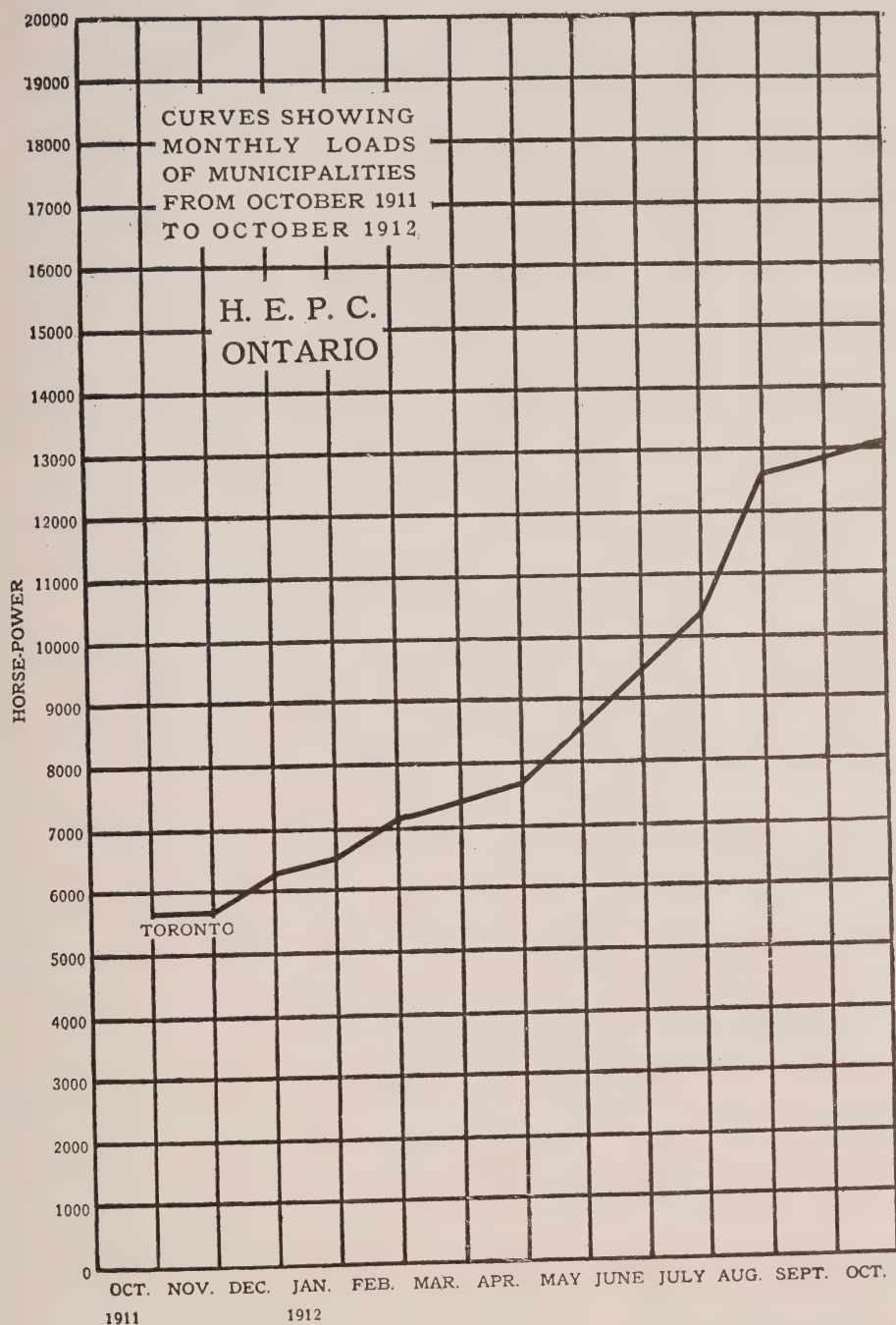


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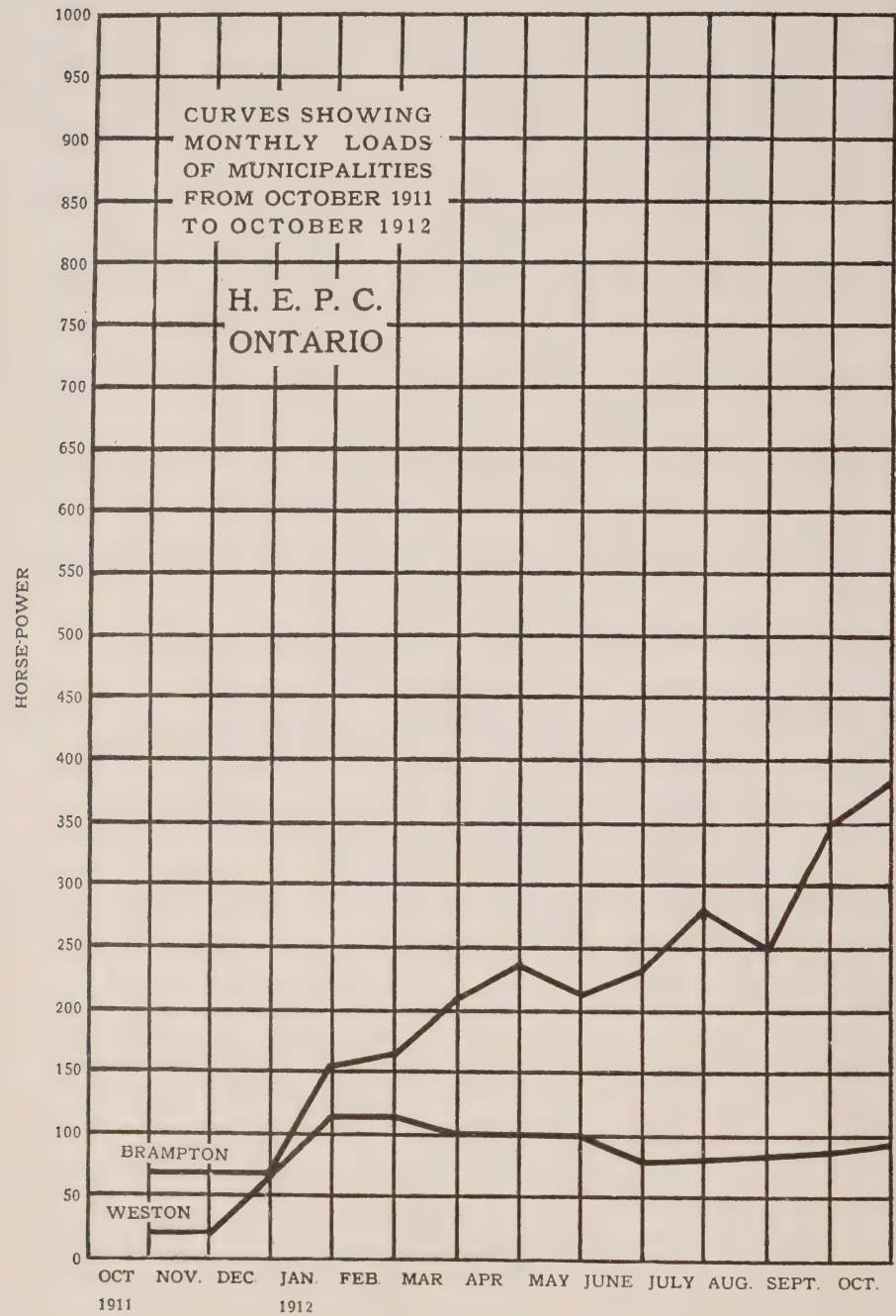


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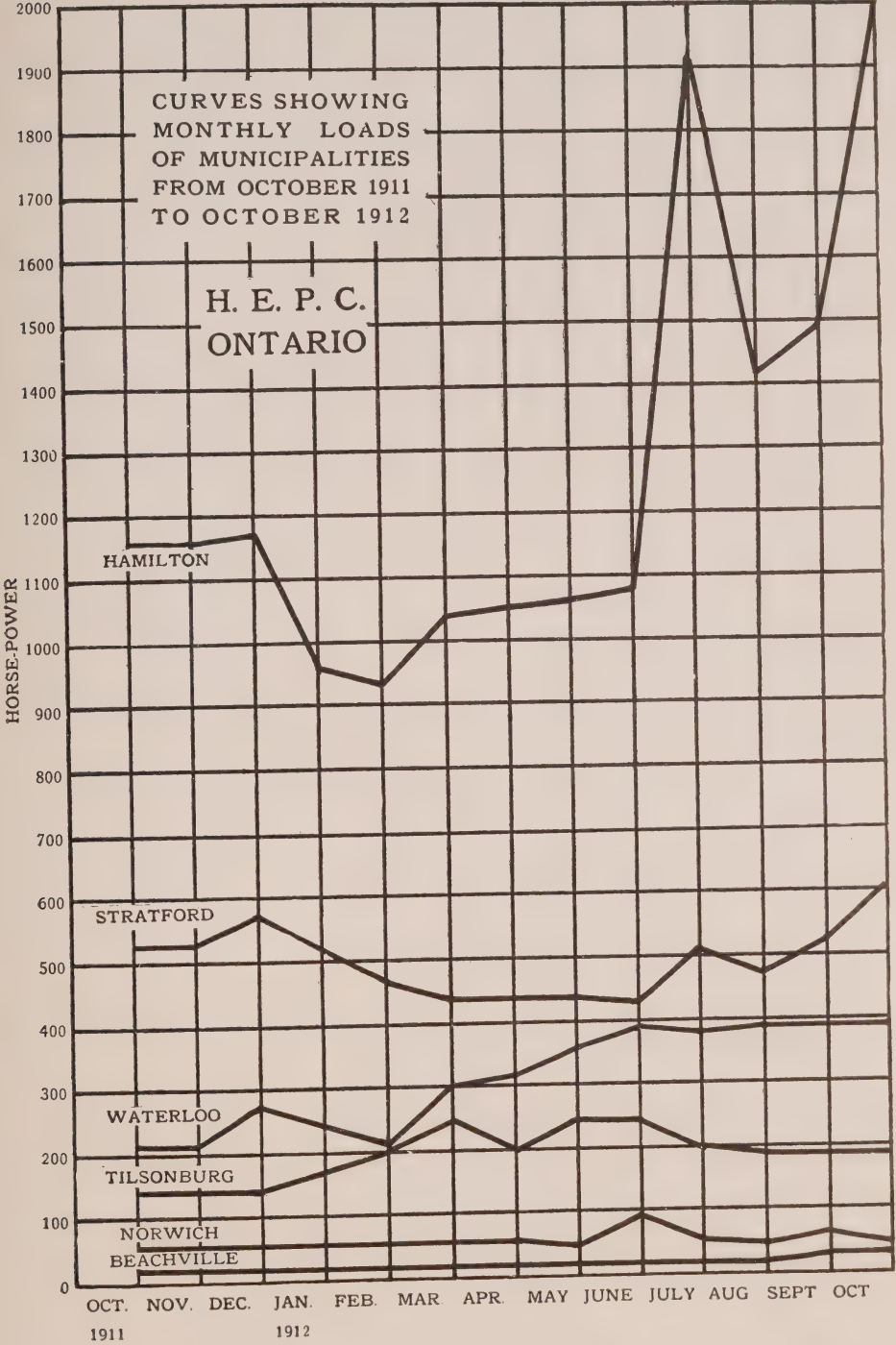


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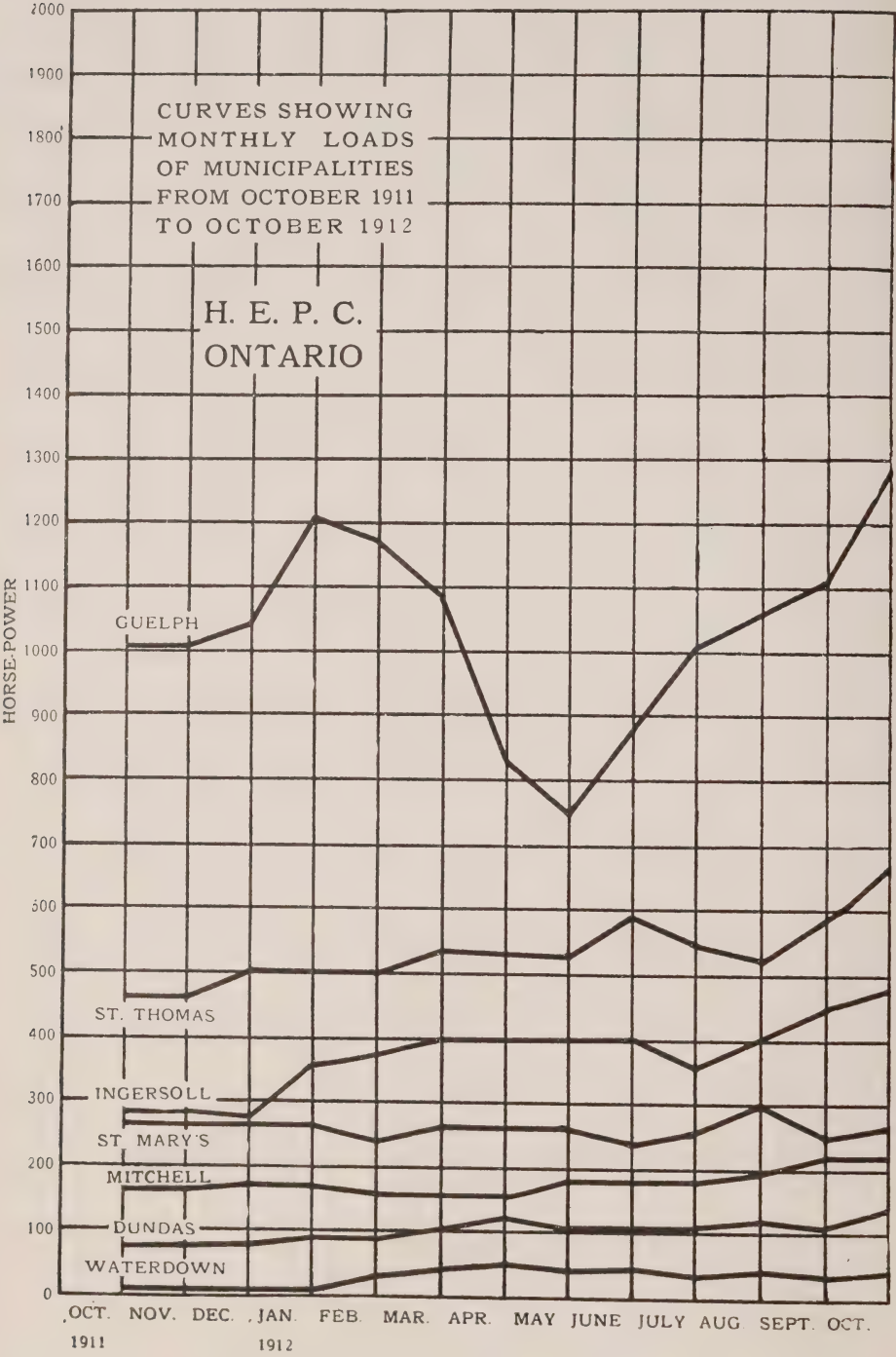


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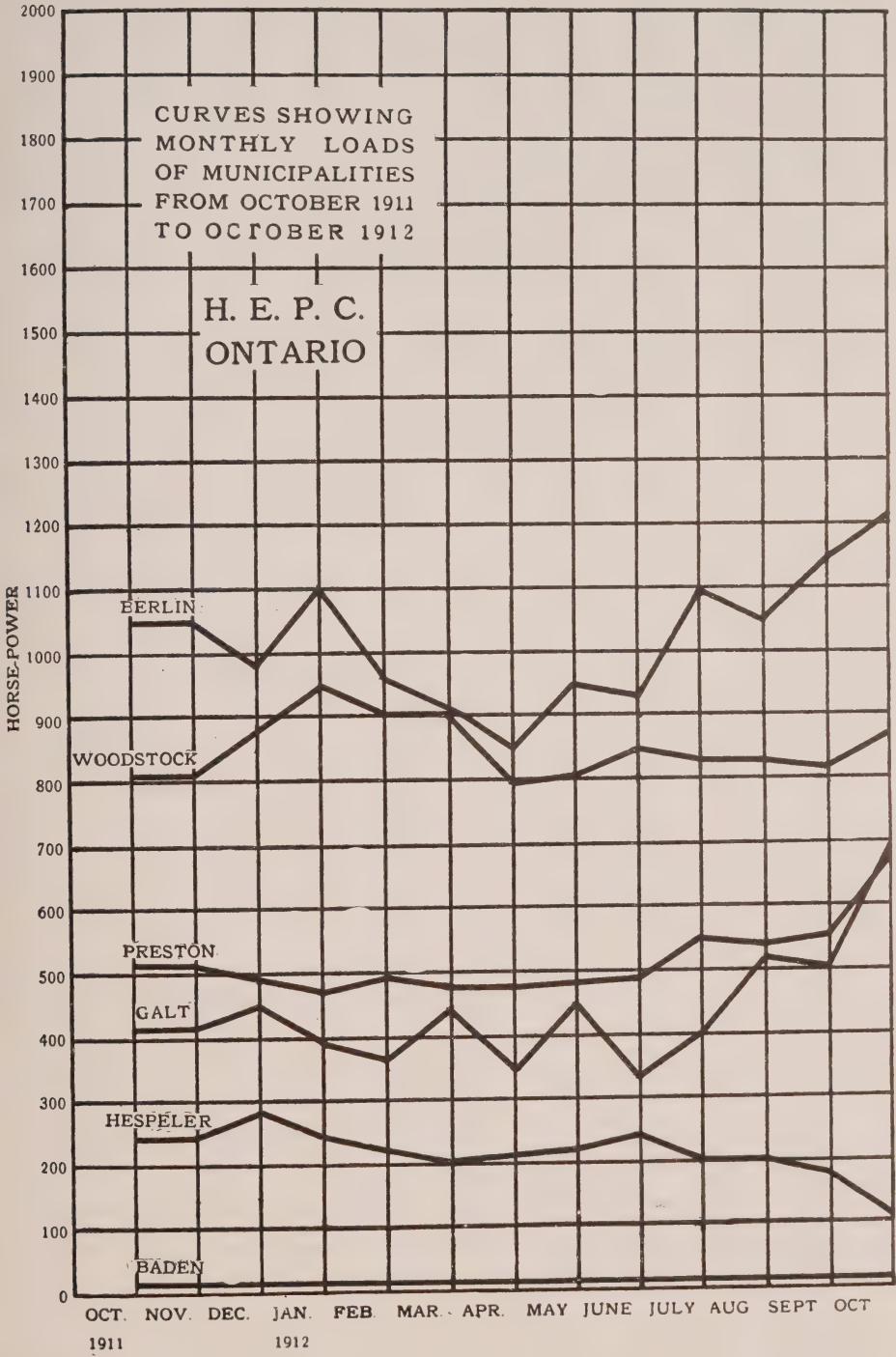


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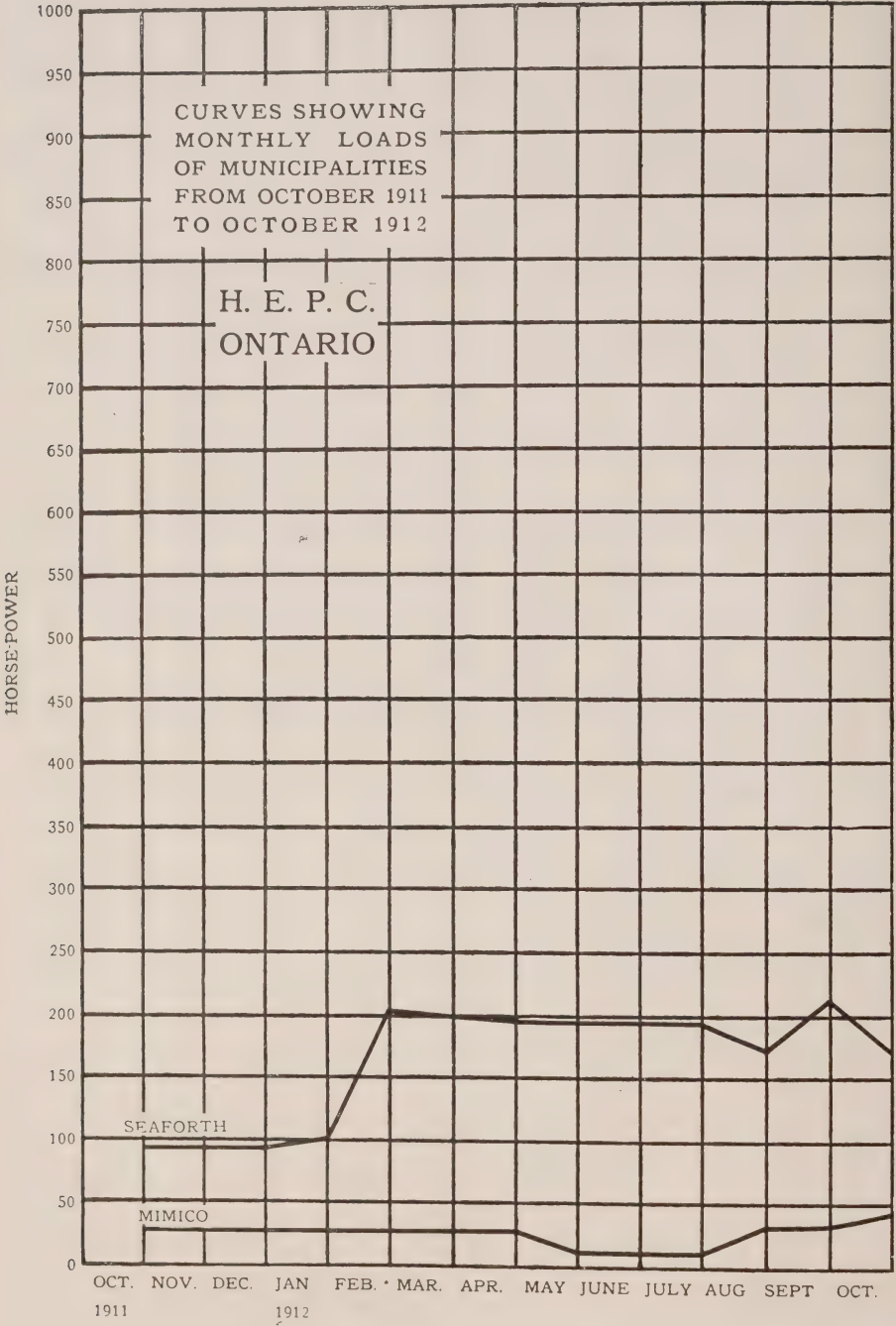
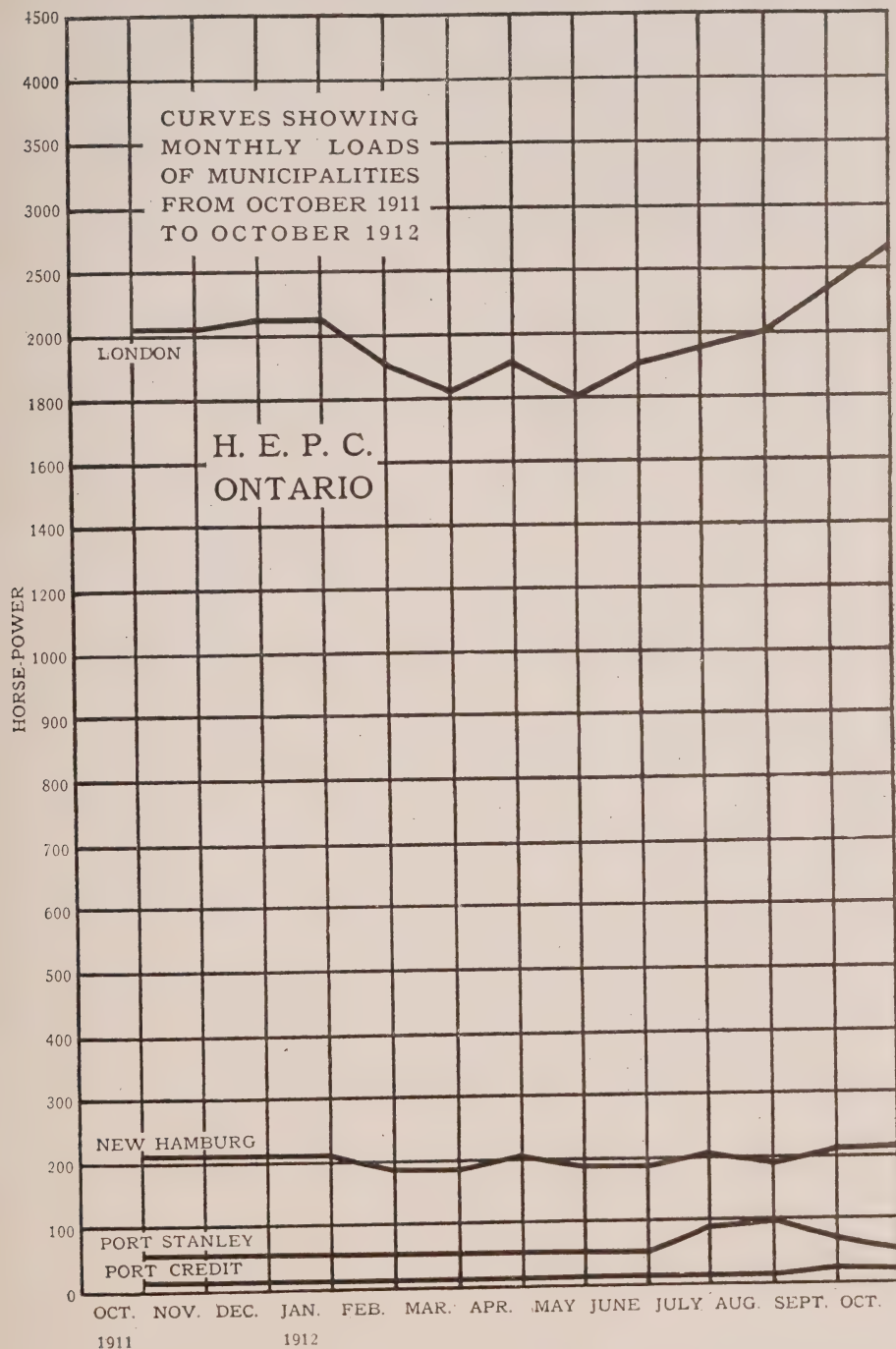


CHART SHOWING POWER CONSUMPTION OF MUNICIPALITIES



The capital investment for the Niagara system on October 31st, 1912, is as follows:—

Right of Way	\$ 542,088 85
Steel Tower Transmission Line.....	1,537,977 72
Telephone Line.....	129,668 95
Relay System Line	54,537 32
Niagara Conduit System	40,907 88
Wood Pole Lines	493,037 99
Transformer Stations.....	1,322,806 73
Distributing Station	37,803 80
Grand Total	\$4,158,820 24

The operating and maintenance expenses for the year have been kept well within the estimates and are as follows:—

Operators' salaries and expenses, including operating supplies.....	\$48,916 06
Maintenance of Transformer Stations	20,546 05
Maintenance of Transmission Lines	18,433 37
Administration and general office expenses	21,119 08
Total	\$109,014 56

A financial statement of Niagara System Operation for fiscal year ending October 31st, 1912, is given below:—

Disbursements			Receipts			
Power purchased, including losses of transmission and transformation administration, general expenses, operation, maintenance and interest			Power delivered including charges for administration, general expenses, operation, maintenance and interest			
—	H.P.	Amount	H.P.	Amount	Surplus.	
					H.P.	Amount
1st quarter	53,397	\$101,505 49	53,149	\$108,920 08	—248.	\$7,414 59
2nd quarter.....	56,576	108,922 98	58,326.1	117,213 59	1,750.1	8,290 61
3rd quarter.....	58,641	116,693 83	64,306.5	127,986 38	5,665.5	11,292 55
4th quarter	78,825	129,513 13	80,723.8	157,681 83	1,898.8	28,168 70
	247,439	456,635 43	256,505.4	511,801 88	9,066.4	55,166 45

	H.P.	Amount.
Sum of monthly load and revenue	256,505.4	\$511,801 88
Sum of monthly power load purchased and costs	247,439	456,635 43
	9,066.4	\$55,166 45
Net proceeds, \$55,166.45.		

FIRST ANNUAL ADJUSTMENT OF CAPITAL EXPENDITURES, OPERATING EXPENSES AND FIXED CHARGES.

Niagara System. Fiscal year 1911-1912

	Rate	Yearly average H.P.	Capital Cost	Interest	Operation including administration and general ex- penses, and main- tenance	Cost of Power in- cluding losses.	Total expenses in- cluding losses in transmission and administration, and cost of power, general expenses, operation, main- tenance and interest	Receipts	Surplus for Depre- ciation Reserve	Shortage on In- terest Account	Net Surplus
Toronto.....	18.50	9100	\$ 862,666	\$ 33,396	\$ 22,068	\$ 81,940	\$ 137,404	\$ 168,982	\$ 31,578	\$	\$
London.....	28.00	2100	544,525	21,016	10,878	18,909	50,803	61,009	10,206	.....	.....
Guelph.....	25.00	1141	214,715	8,348	7,602	10,265	26,215	29,414	3,199	.....	.....
Stratford.....	32.00	492	174,026	6,732	4,494	4,430	15,656	15,938	282	.....	.....
Seaforth.....	41.00	152	92,196	3,358	1,610	1,369	6,337	6,595	258	.....	.....
Mitchell.....	38.00	184	84,789	3,185	1,843	1,657	6,685	7,053	368	.....	.....
St. Thomas.....	32.00	590	286,827	10,807	7,357	5,314	23,478	19,336	.....	4,142	.....
Pt. Stanley.....	.....	38	42,537	1,124	495	340	1,959	2,182	223	.....	.....
Woodstock.....	26.00	833	170,865	6,587	4,536	7,499	18,622	21,869	3,247	.....	.....
Ingersoll.....	28.00	392	104,709	4,038	2,667	3,528	10,233	12,475	2,242	.....	.....
Tillsonburg.....	32.00	180	83,145	3,247	1,578	1,627	6,452	6,486	34	.....	.....
Norwich.....	30.00	32	21,358	562	335	285	1,182	1,064	.....	118	.....
Beachville.....	33.89	6	7,099	106	36	55	197	194	.....	3	.....
Berlin.....	25.00	1012	211,268	8,192	6,818	9,112	24,122	25,289	1,167	.....	.....
Waterloo.....	26.00	322	72,199	2,805	2,261	2,899	7,565	8,364	399	.....	.....
New Hamburg.....	32.00	99	46,545	1,829	788	891	3,508	3,654	146	.....	.....
Baden.....	36.95	7	7,939	111	53	63	227	274	47	.....	.....
Preston.....	25.00	785	138,625	5,373	4,019	7,072	16,464	21,897	5,433	.....	.....
Galt.....	25.00	658.3	134,015	5,208	3,482	5,929	14,619	19,397	4,778	.....	.....
Hespeler.....	26.00	325.3	64,277	2,498	1,776	2,929	7,203	8,811	1,608	.....	.....
St. Mary's.....	38.00	304	226,033	8,576	6,961	2,737	18,274	11,946	.....	6,328	.....
Dundas.....	17.00	121.6	17,100	555	641	1,093	2,269	2,302	33	.....	.....
Hamilton.....	1534.7	17.00	223,724	7,231	9,304	13,818	30,353	29,775	.....	578	.....
Waterdown.....	37.50	34.6	12,133	362	204	313	879	1,221	342	.....	.....
Pt. Credit.....	36.79	15	6,682	113	108	137	358	1,453	95	.....	.....
Weston.....	30.00	273.5	83,259	3,217	2,219	2,461	7,897	7,781	.....	116	.....
Brampton.....	29.00	647	146,383	5,617	4,848	5,826	16,291	17,753	1,462	.....	.....
Mimico.....	30.74	39.5	28,637	5,577	323	355	1,255	1,093	.....	162	.....
Caledonia.....	29.10	1.1	1,610	8	7	11	26	41	15	.....	.....
Totals.....	.....	21456	4,109,886	154,758	109,311	192,864	456,933	512,648	67,357	11,642	55,715

PORT ARTHUR SYSTEM

The Port Arthur System has been carefully inspected during the year and is in excellent condition. From the past and present indications the territory served by this line should very shortly become one of the most important markets for electric energy in the Province.

The exterior appearance of the sub-station has also been greatly improved since last fall, the grounds having been levelled and graded. The interior presents a somewhat crowded appearance, due principally to the installation of a new motor generator set and the necessary electrical equipment to provide for its operation. A few changes of minor character relative to this equipment were suggested and these are now being made by the company installing the apparatus.

The new Dominion Government Grain Elevator at Port Arthur will shortly be supplied from this station with power over an additional circuit erected on one of the two high tension lines already in use for a distance of $2\frac{1}{2}$ miles and a short pole line two miles in length to the elevator. This line will operate at a potential of 22,000 volts transforming at the receiving point to a potential of 550 volts to supply over 65 motors in the elevator, aggregating approximately 2250 h.p. The elevator, it might be mentioned, is situated in the centre of an industrial district, which, in the near future, should develop into a very attractive market.

The increases in the load of the Municipal system for the last year are not shown in the load records at the sub-station, as the plentiful water supply of last season enabled the Municipal Hydraulic Station on the Current River to generate sufficient power to meet this demand without necessitating the purchase of more than 1890 h.p. from Kaministiquia Power Co. This arrangement has provided a most economical method of operation. The average load factor of the system last year was 95%. When the proposed line to the grain elevator is built and additional customers connected, the demands on the sub-station should be at least twice those at the present time.

The capital investment for the Port Arthur System on October 31st, 1912, is as follows:—

Transmission Lines	\$15,801 29
Transformer Station	58,763 91
Interest during Construction	1,496 29
Grand total	\$76,061 49

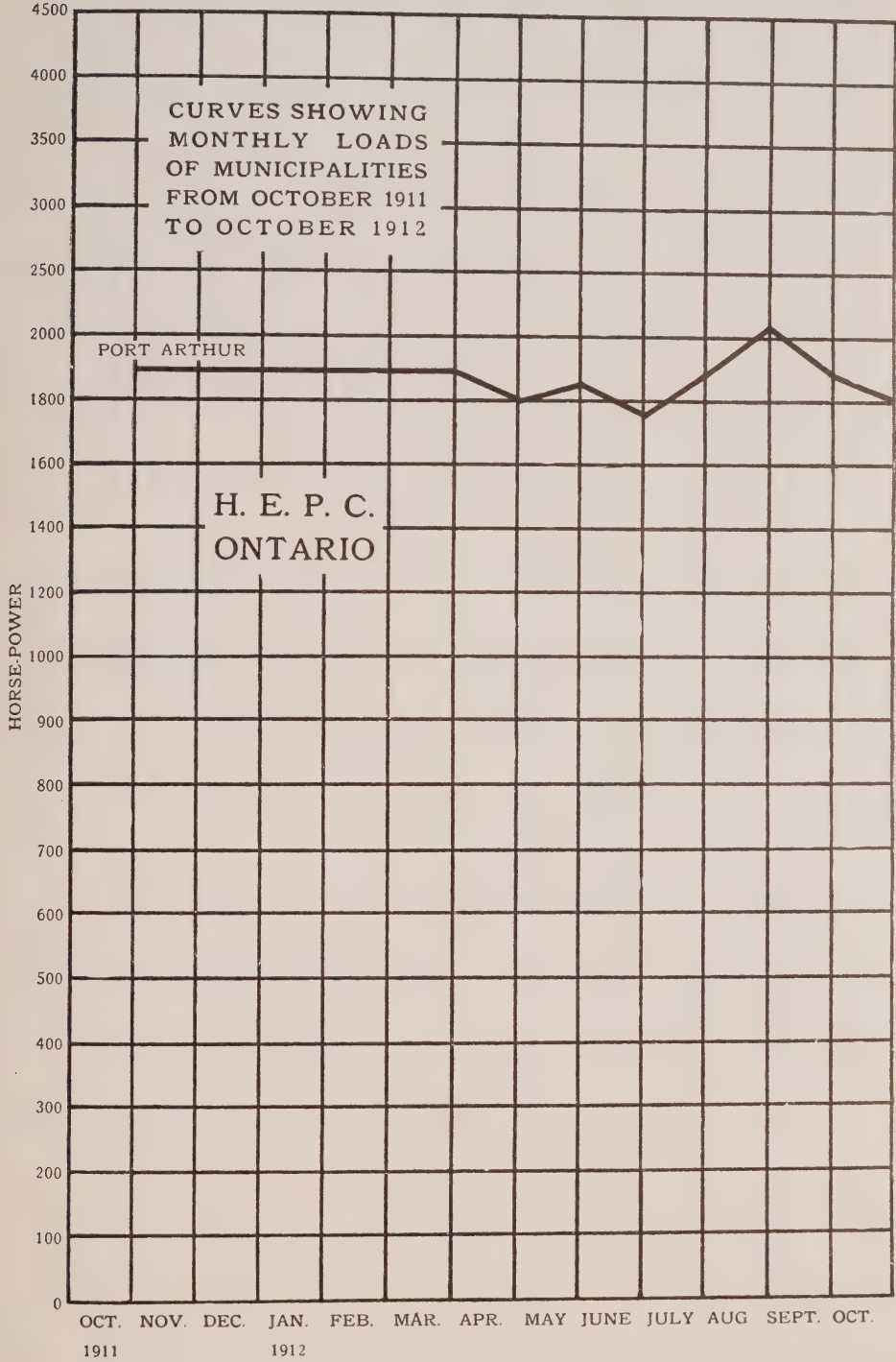
The operating and maintenance expenses from Dec. 15th, 1910, to October 31st, 1912, are as follows:—

Interest on Capital Cost during operation	\$4,707 15
Sinking Fund (1.8 per cent.)	2,118 20
Depreciation (4.5 per cent.)	5,295 64
Operation Costs	2,002 55
Cost of power—43,628 h.p.	57,125 23
	\$71,248 77

A financial statement of operation from Dec. 15th, 1910, to October 31st, 1912, is given below:—

Sum of monthly loads delivered and value, including charges for administration, general expense, operation, interest, sinking fund and depreciation—43,628 h.p.	\$72,342 64
Sum of monthly loads purchased and value, including administration, general expense, operation, interest, sinking fund and depreciation—43,628 h.p.	71,248 77
Surplus	\$1,093 87

CHART SHOWING POWER CONSUMPTION OF PORT ARTHUR



SEVERN SYSTEM

The Severn System is at present being supplied with power from the Simcoe Railway and Power Company.

The Corporation of Midland is supplied with energy at 2,200 volts, 3 phase, 60 cycle, direct from the Midland station of the Power Company, metered at the latter point.

The operation of the Midland plant during the past year has been very satisfactory, the total connected power load, not including a 75 h.p. 600 gal. motor driven turbine pumping outfit installed in the pumping station, aggregating 200 h.p. Energy is also supplied for 216-100 watt series tungsten street lamps, 16-6.6 ampere series arc street lamps and 581 residential and commercial services. The lighting peak load has increased from 222 h.p. in October, 1911, to 335 h.p. in October, 1912, a total gain of 113 h.p. The power load has increased from 125 h.p. to 200 h.p. during the year. Negotiations are now under way to effect the annexation to the Corporation of Midland of a district known as "Dollar Town." The ratification of this agreement by the Ontario Railway and Municipal Board is all that is needed to close these proceedings. This annexation should increase the load of the Corporation of Midland for the coming year at least 100 h.p.

The Corporation of Penetanguishene is supplied with energy at 22,000 volts, 3-phase, 60 cycle, from a point on the line of the Simcoe Railway and Power Company near their Midland Station. A single circuit wood pole line 4.5 miles long erected along the streets of Midland and then directly across country to Penetanguishene supplies the Municipal plant with energy. This station is located adjacent to the pumping station of the Corporation in order to minimize operating costs. The installation of the electrical equipment was completed and current first delivered on the 27th of November, 1911; service was supplied on the first of December. During the month of January, 1912, a 600 gal. motor driven turbine pump was installed in the pumping station and the water supply of the town since then has been handled by this unit.

The load for the first month of operation was 134 h.p. and for the past year 240 h.p. The Corporation now has a total connected power load of 250 h.p. It is expected that before the close of next year this load will be augmented by the addition to the system of the power and lighting loads of two large industries, one of which is now erecting a factory, and the other of which plans very shortly to commence similar operations.

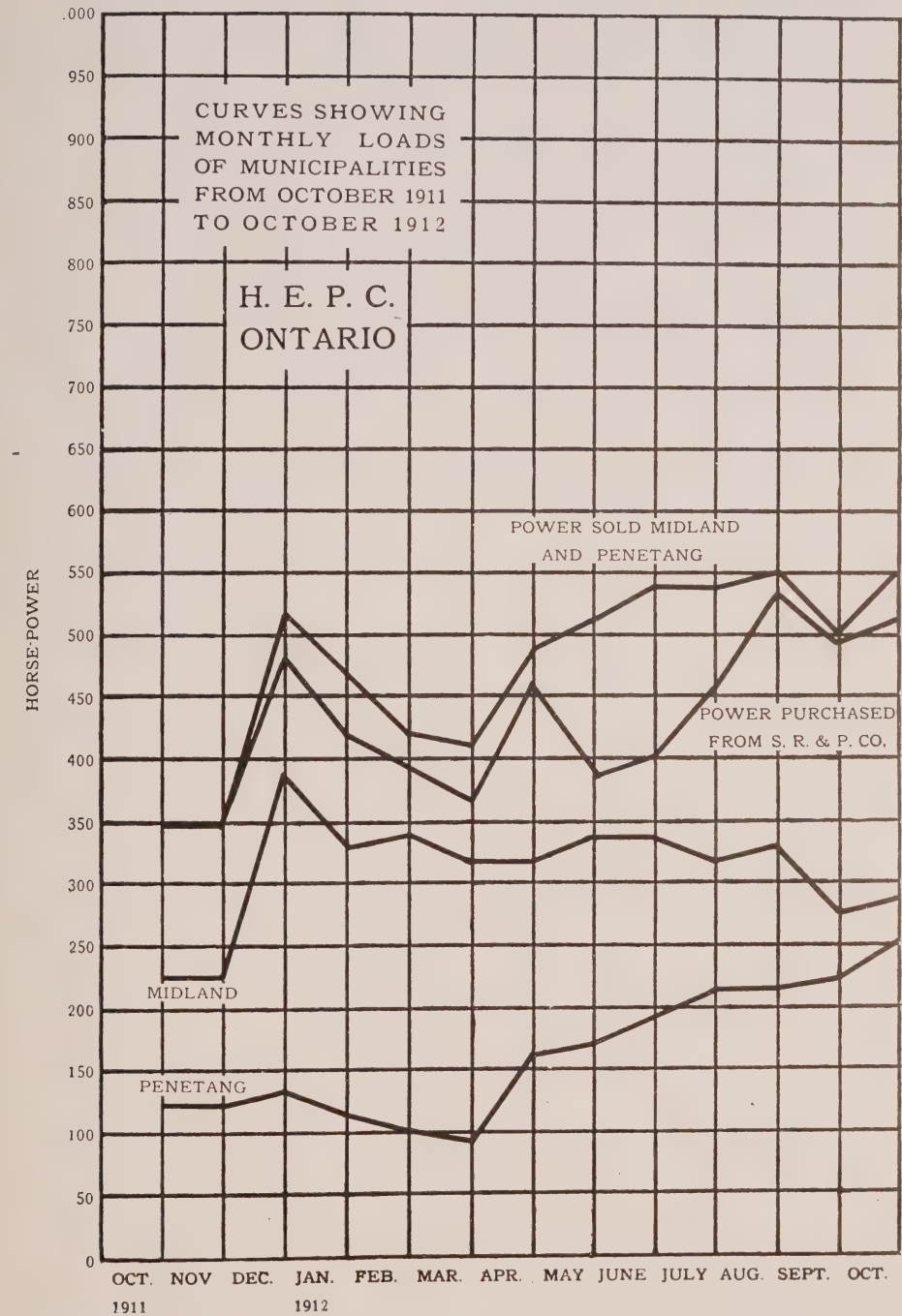
The capital investment for the Severn System on October 31st, 1912, is as follows:—

Midland Capital Cost.
Paid up.

Penetang Capital Cost.

Transmission Line	\$8,611 65	
Transformer Station	6,331 04	
Interest during Construction	70 06	
		\$15,012 75
Grand total		\$15,012 75

CHART SHOWING POWER CONSUMPTION OF MUNICIPALITIES



The maintenance and operating expenses from July 1st, 1911, to October 31st, 1912, are as follows:—

Cost of Power	\$3,527 94
Interest	698 77
Depreciation	600 96
Operation Costs	133 28
Total	<u>\$4,960 96</u>

A financial statement of operation from July 1st, 1911, to October 31st, 1912, is given below:—

	H.P.	Amount.
Sum of monthly loads delivered and value, including charges for administration, general expenses, depreciation and interest.	2,361.5	\$5,649 53
Sum of monthly loads purchased and value, including adminstration, general expenses, depreciation and interest.....	<u>2,131.6</u>	<u>4,960 96</u>
Surplus	229.9	\$688 57

TOTAL CAPITAL COST TO OCT. 31st, 1912.

Following is a statement of Expenditure on Capital Account including Niagara, Port Arthur, Severn, St. Lawrence and Renfrew Systems, also Municipal Construction (chargeable), Stock on hand, and Tools; together with Expenditures on behalf of Province and value of assets on same account.

Niagara System

Transmission Lines

Right-of-Way		\$542,088 85
Steel Tower Lines	\$1,537,977 72	
Telephone Lines	129,668 95	
Relay Lines	54,537 32	
Conduit and Cable System, Niagara Falls	40,907 88	
		1,763,091 87
Wood Pole Lines		493,037 99
		<u>\$2,798,218 71</u>

Transformer Stations

Stations in Operation	\$1,319,885 19	
Station Extensions	2,921 54	
		1,322,806 73
Distributing Stations		37,803 80
		<u>\$4,158,829 24</u>

Other Systems

Port Arthur Capital Cost

Transmission Line	\$15,801 29	
Transformer Station	58,763 91	
Interest during Construction	1,496 29	
		76,061 49

Penetang Capital Cost

Transmission Line	\$8,611 65	
Transformer Station	6,331 04	
Interest during Construction	70 06	
		15,012 75

St. Lawrence System

Distributing Stations	\$10 03	
Transmission Lines	6,614 27	
		6,624 30

Severn System

Distributing Station	\$1,104 50	
Transmission Line	28,407 01	
		29,511 51

Renfrew System

Hydraulic Construction		4,769 70
		<u>\$4,290,808 99</u>
Windsor Extension to Niagara System		2,126 61

Municipal Construction Chargeable

Various Municipalities	\$15,499 97	
Toronto Entrance	253,527 10	
		269,027 07

Stock and Tools

Line Construction and Maintenance Stock on hand		14,037 80
Line Construction, tools on hand		3,829 47

Total expenditures \$4,579,829 94

PROVINCIAL EXPENDITURES

Provincial Account for Fiscal Year, 1911-12

Engineering assistance to Municipalities, advising on construction of distribution systems, rates and accounting, statistics, including travelling expenses.	\$50,458 53	
Hydrographic surveys, reports on stream flow and power sites for the Province	16,678 24	
Standardizing of Municipal Station equipments and apparatus, including testing of lamps and meters..	3,910 86	
Preliminary surveys for projected construction.....	3,802 10	
Inspections and hearings of applications of Municipalities for overhead and underground systems	4,595 00	
Rules and regulations for the installation of systems for the utilization of electrical energy	9,654 66	
Practical demonstrations of the uses of electrical energy on the farm; also exhibitions on the farm and at Exhibitions, including expenses of Engineers	8,653 05	
Shop and development work on the improvement of apparatus; also testing equipment, instruments, etc..	8,619 99	
Illuminating engineering investigations	385 35	
Administration, Auditing and Secretary's staff	11,183 84	
	<hr/> \$117,941 62	
Interest to October 31, 1912, on above expenditures and capital expenditures, as follows	5,810 37	
	<hr/>	123,751 99
Capital Expenditures		
Equipment for Exhibition and farm demonstrations	\$12,404 95	
Shop tools and testing equipment	16,948 16	
Instruments, Hydraulic Department	999 90	
	<hr/> \$30,353 01	
Storehouse	\$9,556 19	
Department of Public Works	6,331 54	
Municipal stationery and accounting forms ..	691 79	
	<hr/> 16,579 52	
	<hr/>	46,932 53
Total expenditures		<hr/> \$170,684 52

CHAPTER IV

MUNICIPAL WORK

MUNICIPAL ADVICES

Municipal Department

The Municipal Department is employed to secure the necessary information for the preparation of estimates on the cost of supplying power to those districts desiring it through data collected by surveys of the districts and investigations of the possible power demands. These investigations are made, and estimates submitted at the request of the municipalities desiring power. After a contract for supply of power has been made between the municipality and the Commission, the latter acts as consulting engineer when so requested, and is expected to prepare engineering plans, specifications, call for tenders, and supervise the erection of the necessary material and apparatus. Later, after power is delivered, this Department aids the municipality in building up its power load by acting as a power solicitor, and advising the town and consumers regarding the amount of power necessary and the proper electrical equipment.

The standardization of apparatus, unification of rates and the inauguration of standard accounting systems are also under the direct supervision of the Municipal Department, which is expected to give advice on questions of an electrical nature at the request of any municipality in the province.

The work accomplished by this Department during the period covered by the report is given in detail in what follows; the municipalities being arranged in alphabetical order:—

Acton

On November 1st, 1911, a letter was received from Acton, stating that it had been decided by the Reeve and Council to submit the enabling by-law.

On February 19th, 1912, when submitted to the people, both the enabling and money by-laws were carried almost unanimously. In the meantime, investigations had been made and reports submitted on the condition of the Municipal plant and the possibility of obtaining a power load. Estimates were also made on the probable cost of rebuilding and extending the distribution lines for the supply of both light and power.

On April 30th, a contract was executed by the Corporation covering a supply of 200 h.p. at an estimated cost of \$36.00 per h.p. per year. Specifications were then prepared for the construction of a sub-station and for the sub-station apparatus. Details of the transmission line from Guelph and of the local lines were also gone over and the necessary material ordered for the construction of these lines.

Construction on the transmission line was commenced in August and on the sub-station building the following month. Material for the construction of the low tension lines has arrived and preparations are under way for commencing this portion of the work.

Ailsa Craig

During the latter part of 1911 a letter was received from the Mayor of Ailsa Craig, who wrote, at the request of a number of the residents, requesting information.

The village was visited and the power question fully discussed, with the result that an enabling by-law was presented and passed by a large majority at the January elections 1912.

An estimate for the supply of 100 h. p. to Ailsa Craig, in conjunction with other places in that district, was made and is now being revised.

Ancaster Township

At various times during the year requests have been received from residents of the township, asking for estimates of the cost of power delivered in small quantities and also asking for instructions as to the procedure which should be followed to arrange for service. Copies of the "Act to Provide for the Local Distribution of Electric Power of 1911", together with petition forms were sent in answer to such requests, with explanatory letters. During the fall, some of these petitions were received from the township council, with requests that estimates be furnished. These had to be returned to the township for further information as to the amounts of power desired and the location of some of the applicants.

Similar requests were received from the adjacent townships and as there are a number of radiating low tension and relay pole lines through that district, it was decided that power could be furnished cheapest to all concerned by laying out a system of distribution covering all the applications received, rather than treating each one separately. Consequently, letters were sent out asking each township to bring their petitions up to date so that united action might be taken.

The district surrounding West Hamilton Post Office has grown steadily during the last two years and there have been continued requests for power for domestic use. Recently this was augmented by a Hydro customer operating a planing mill in Dundas, who has erected a mill in West Hamilton. When petition forms were circulated, following some public meetings, some 140 residents signified their desire for power. With this number supplied in the district, the matter of lighting the streets becomes very inexpensive and will soon be taken up.

The matter of a supply was taken up with Dundas town and an engineer visited the district a number of times to gather data. From the information thus obtained a rough estimate was made of the cost of a system. The estimate amounted to, approximately, \$8,000.00, and included a 2,200 volt, three-phase line from Dundas Station to West Hamilton and construction complete, in the district, to supply 125 customers. The Town of Dundas is making a canvass of the district and expects to be able to request that the line be built at once. If this is done, the money will be advanced to erect all the construction and Dundas will be charged the interest and sinking fund on money so expended. The cost of power to customers in West Hamilton will be practically the same as in Dundas.

Ancaster Village

In the early winter the Trustees of the Police Village of Ancaster asked for a supply of power. Information was sent, stating how Police Villages are supplied, and on receipt of the data from the Village, the matter was referred to the Estimating Department to lay out a scheme for supplying the load with an estimate of the cost of power so delivered. This information will be sent out shortly.

Appleby

See Report on Nelson Township.

Atwood

On March 7th, 1912, a representative visited Atwood and obtained information in regard to the probable demand for power in that locality. It was found that about 400 h.p. could be utilized in this district and estimates of the cost of transmitting this power have been prepared, and are now being revised to agree with reduced costs on the Niagara System.

Aurora

See Report on Newmarket District.

Ayr

On November 20th, 1911, a letter was received from the Village of Ayr, asking for information. A reply, dated November 28th, 1911, gave them all the procedure necessary to bring the matter up and on January 25th a resolution was forwarded requesting that the question of Hydro-Electric Power for the Village of Ayr be considered.

Detailed information was obtained regarding the local plant, and the power requirements of the Village, and on May 16th a letter was directed to the Reeve, giving the estimated costs in conjunction with the demands of Wolverton, Drumbo, Innerkip and Plattsville.

Baden

At the request of the Trustees of the Village of Baden estimates were prepared during the current year on the cost of power and also on a local distribution system. Construction work was carried out under supervision and current was turned on in Baden by the Chairman on December 29th, 1911. This Village now enjoys a well balanced system of street lighting. Distribution lines make power and light available at any point within the Village.

Barrie

On November 14th, 1911, Mr. Donald Ross, Chairman of the Barrie Board of Trade, first communicated with the Chairman relative to securing power for Barrie from the Simcoe Railway and Power Co. at the Big Chute on the Severn River, with the ultimate result that the Town Council passed a resolution on December 5th, requesting an estimate on the cost of delivering 750 h.p. to Barrie.

Various routes for the transmission line at divers voltages were investigated, and after careful consideration it was estimated that 700 h.p. could be delivered to the town at a cost of \$31.97 per h.p. year, being transmitted from Waubauskene at 22,000 volts, and delivered at 2200 volts, using the present power house building for housing the step-down apparatus. It was also estimated that it would be necessary for the town to expend \$7,000.00 on the present distribution system, in stringing new feeders for power circuits, and to provide for additional station apparatus.

On June 3rd, 1912, the ratepayers of Barrie voted on two by-laws, one to enter into a contract for 700 h.p., and the other to raise \$7,000.00, both of which were carried almost unanimously.

Construction work on the transmission line was started during the latter part of September, 1911, and a contract was let to the Canadian General Electric Company for the station equipment. The pumping station apparatus was examined and detailed plans and specifications for motor driven turbine pumps were prepared.

Power is expected to be turned on in Barrie shortly after the first of March, 1913.

Bayfield

The probable demand for power in Bayfield has been considered in conjunction with the other municipalities in Huron County.

Beachville

Early in November, 1911, the Trustees were advised of the possible sites for a sub-station, and requested that they arrange to secure one of them. Plans and specifications having been prepared, they were forwarded to the Trustees; it was decided later to supply 2200 volt power to villages, so the station was built by the Commission.

After notifying the Trustees a temporary arrangement was made, whereby the Standard White Lime Co. was supplied with 2200 volt power from Woodstock Station, using one of the Woodstock-Ingersoll lines.

The contract was signed and received the last week in January.

By request from the Village Trustees supplies were purchased and men furnished to build the distributing system and arrangements were made with the Independent Telephone Co. of Ingersoll and the G.N.W. Telegraph Co. for joint use of poles.

The station having been completed, the Trustees requested an official opening, a demonstration, and that Mr. Beck be present to push the button to turn on electricity for use in Beachville.

Their request was granted and arrangements were made with various manufacturers for the loan of different types of motors, heating apparatus, etc.

Mr. Beck, accompanied by Mr. Pocock Chairman of the London Commission, opened the demonstration. As an example of the uses to which electricity may be put a cow was milked by means of an electrically operated milker, the cream was then extracted in a separator driven by an electric motor, and coffee was made in an electrically heated percolator.

From the time the milking was finished to the serving of the coffee only about 3 minutes was required by the other operations.

Mr. Beck, during an address, then turned on the current and the Village streets were brilliantly lighted by the lamps installed permanently for that purpose, as well as by a great number of colored lamps that had been strung up for the occasion.

The demonstration consisted of showing the uses of all manner of devices for general service both in the home and on the farm, viz.: toasters, flat irons, coffee percolators, tea samovars, chafing dishes, water heaters, table grills, curling iron heaters, cigar lighters, soldering irons, radiators, vacuum cleaners, a standard range, a fireless cooker, a washing machine, and farm implements of different kinds, such as a buzz saw, turnip pulper, etc. driven by motor.

Another Lime Co. has started operation and although the quarries are in the townships of North and West Oxford, outside the Village limits, the contract has been transferred to the Village; the line is now being built and service will be connected at an early date.

The results have been very satisfactory in every way.

Beamsville

On November 13th, 1911, at the request of the Village Clerk, blank application forms and other information were sent to the Village of Beamsville. An enabling by-law was submitted to the ratepayers on January 1st, and carried.

A thorough and complete engineering study was started of Beamsville, together with all the territory from Hamilton to St. Catharines and south to Dunnville, in order to evolve the most advisable and economical system of supply for this territory. Various estimates have been made, but no definite plan has been submitted to the interested municipalities.

Beaverton

See Report on Ontario County.

Berlin

Improvements to the street lighting system have been made during the current year, ornamental single light standards having been installed on several residence streets. The series tungsten lighting is replacing the old direct current arc lighting system in use on the main street. The street lighting in Berlin is now in better condition than ever before, a more even distribution being particularly noticeable. The house lighting load is steadily increasing, as well as the power demand.

Estimates have been prepared for supplying a large block of power to a new factory now being built in Berlin. Additional station capacity is contemplated for this service. As a whole, the year's operation has been successful and general satisfaction is expressed with the results obtained.

Maximum load October, 1911—1045 h.p.

Maximum load October, 1912—1206.5 h.p.

Further increase is assured for the coming year.

Beverley Township

A petition was received from the Council, asking for estimates to supply a number of prospective customers. This is being considered with applications from the adjoining townships.

Blanshard

On March 1st, the Clerk of the Township of Blanshard asked for information in regard to the supplying of light and power to the Village of Kirkton from St. Mary's.

The information desired was forwarded and later a survey was made of the Township, with the object of laying out a proposed distribution system as a basis for an estimate.

Blyth

A by-law was submitted to the ratepayers of Blyth at the Municipal Election in January, and carried by a substantial majority.

On January 30th, 1912, a letter was written to the Clerk, urging co-operation, and asking what action the Council intended to take.

Bradford

See Report on Newmarket District.

Brampton

Previous reports on this town have dealt with preliminary matters pertaining to a supply of power and closed with plant construction. An engineer visited the town regularly to assist them in the details of the system and to keep check on the installation of the sub-station equipment. Prospective power users were also seen and a number of contracts signed on behalf of the town.

The class of construction used in the town is an example that any city might follow, and by using the high British Columbia Cedar poles the construction has not marred the beauty of the streets nor ruined the shade trees as was predicted. The system of street lighting is considered one of the best in the Province.

Most of the factories in and around the town are using electric power and some new manufactories have also signed their contracts for a supply. During October of the present year the Town of Brampton took 373.5 h.p. and the present indications are that there will be a great increase over this amount during the coming year.

Brantford

On December 6th, 1911, a copy of the by-law was forwarded to the City Clerk of Brantford with full instructions as to the manner in which they should apply for a supply of power. Estimates of the cost of installing distribution systems in the City of Brantford to utilize Hydro-Electric power were prepared and submitted to the Council for consideration.

In the summer it was decided to submit enabling and money by-laws to the people for a supply of power and the construction of a distribution system. A very active campaign was waged against the by-laws, but they were carried, on October 25th, by a very satisfactory majority. Instructions were at once issued to draw up a contract to be submitted to the Council early in November.

Brechin

See Report on Ontario County.

Brockville

On November 30th, 1911, a letter was written to the Clerk at Brockville, giving the estimated cost of power for the municipalities in that district. A copy of the short form of by-law was also forwarded with all the necessary information in connection with same.

It was decided that this by-law should not be submitted at the Municipal Elections at the first of the year, and the vote on the by-law was, therefore, deferred until April 25th, when it was carried by a large majority. A contract for 1,000 h.p. at \$24.04 per h.p. per year was drawn up at once and sent to Brockville, with the request that it be executed and returned at once. There was some delay before it was signed, but it was finally signed by the Mayor and returned on July 30th.

Bronte

A letter was received from the Secretary of the Police Trustees, asking for information on the cost of power, and in response to it, an investigation was made of the district.

It was reported that there was a possible load of 50 or 60 h.p. in the Village and that the supply line could be built to the Village through a district in which there was a considerable demand for rural power. An estimate was made up for the supply of power to the Village, and sent to the Trustees, giving a cost of \$42.00 per h.p. per year on 50 h.p., delivered to the Village at a voltage suitable for local distribution.

The Trustees were visited a number of times and information was furnished them as to by-laws that were necessary to enable them to install a system. Public meetings were held to discuss the matter, resulting in the Trustees making application to the Township Council to present enabling and money by-laws before the people at the annual election.

Bruce County

During the week of November 20th, 1911, the various towns and villages in Bruce County were visited, with the idea of bringing the power by-law before the various Mayors and Reeves, and suggestions were made that this by-law be submitted to the ratepayers at the Municipal Elections in January.

The Mayor or Reeve of the following towns and villages, which were visited, promised, in each case, to bring the matter before the Council for consideration:—

Lucknow, Kincardine, Teeswater, Mildmay, Walkerton, Paisley, Port Elgin, Southampton and Chesley.

On December 21st, 1911, a resolution was received from the County Clerk of the County of Bruce, asking for an estimated price on electrical energy from the Saugeen River. This letter was acknowledged with the information that this matter would be taken up at the first opportunity.

On January 30th, letters were written to all the various towns and villages which passed the enabling by-law urging co-operation and asking what action they intended to take.

During the week ending February 24th, all the above mentioned municipalities were visited, in order to ascertain their local power conditions and from the data obtained a complete report was made.

Brucefield

The enabling by-law was submitted to the ratepayers of Brucefield at the Municipal Elections in January, and carried, and a letter was written to the Village Clerk, urging co-operation with the other towns in the district.

Brussels

The enabling by-law was submitted to the ratepayers at the January Municipal Elections and carried. A letter was written to the Clerk, urging co-operation and asking what action the Council intended to take.

Bullock's Corners

See Report on West Flamboro.

Burford

In compliance with a request from the Village of Burford a representative visited that place and made a report on the local power conditions.

Estimates of the cost of delivering power to Burford were made and forwarded to the Clerk on June 14th. Further estimates were made in September on the assumption that certain blocks of power be taken into Burford, Simcoe and Waterford, all three municipalities co-operating.

Caistor Centre

A letter, dated November 13th, 1911, was received from Caistor Centre, asking for information in connection with electrical power for use on farms.

Caledonia

In order that the Village Council might be in a position to sign a contract for a supply of power at any time desired, and also to determine the feeling of the ratepayers on the matter, an enabling by-law was placed before the people at the annual elections in January, 1912. The by-law was passed by a large majority.

A money by-law for \$4,600.00 covering the construction of a municipal system, was prepared and placed before the people. It was carried by a large vote, and then a contract for 25 h.p. at \$29.10 per h.p. per year was signed by the Village. A resolution of the Council was received, with the request that the material be purchased and the construction erected. The material has been ordered and the Construction Department are now erecting the system according to approved plans. Some twelve or fifteen buildings have been wired and are waiting for a supply of power. The Municipality is being assisted in working up a motor load.

The Village authorities have asked for some extensions and some extra street lights. This work and also the construction to the Laurentia Milk Company will increase the cost of the system over the \$4,600.00 estimated upon, and additional money will be raised as soon as the exact amount is known. Power was delivered in September.

Campbellford

The Town of Campbellford, which operates a municipally owned electrical generating and distribution plant, forwarded a resolution, requesting that hydraulic and electrical engineers be sent there to report on their local conditions.

Acting on this request, the Town was visited and from the data obtained a complete report was made on their electrical situation, which report was forwarded to the Town, together with recommendations covering changes needed in their equipment to make it meet their requirements.

(See also Hydraulic Report.)

Cannington

See Report on Ontario County.

Cayuga

Last year a canvass was made of the district between Hamilton and Lake Erie and reports were submitted on the load obtainable near Cayuga.

Many of the Councillors were seen and information was furnished them as to the procedure to be followed to enable them to secure power.

An enabling by-law was placed before the people at the annual election this was passed by a large majority and allows the Village council to enter into a contract for power.

Centralia

The enabling by-law was submitted to the ratepayers of Centralia on January 13th and carried.

On January 30th a letter was written to the Clerk of the Village, urging co-operation and asking what action the Council intended to take.

Chatham

During November and December, 1911, a number of estimates were prepared of the probable demand for power in Chatham in connection with the Windsor extension estimates.

A letter was received from the City Engineer of Chatham, asking advice in connection with proposed extensions of their street lighting system. The desired information was forwarded as well as a sample street lighting bracket and lamp.

During the summer quantities of material were purchased on behalf of the Corporation.

On June 4th, a tabulation, showing the charges for street lighting in various municipalities, was forwarded to the City Engineer.

Chesley

On November 24th, 1911, a letter was received from the Village of Chesley, asking information in regard to Hydro-Electric power, and also assistance in local matters, all of which was duly submitted.

An enabling by-law was submitted to the ratepayers at the January municipal elections and carried by a large majority, and on January 30th, a letter was written to the Town Clerk, urging co-operation with the other towns in the district.

Chesterville

In October, the Council wrote requesting information *re* Hydro-Electric power. Estimates for 100, 200 and 300 h.p. for Chesterville, with Winchester taking a similar amount, were sent in August.

Engineers visited the district and obtained information relative to the amount of power the various towns would require and also addressed a meeting of the people at Chesterville, where a unanimous vote in favor of Hydro-Electric was given. Later in the year revised estimates were given and a contract has been sent to be signed by the Village Council.

Clinton

Clinton carried an enabling by-law in favor of Hydro-Electric at the January elections, 1912.

Later, complying with a request from the town authorities, Clinton was visited and the question of valuing the present plant and probable cost of remodelling same for 25 cycle power from the Niagara System discussed with the Mayor and others. This estimate was made, and also an estimated cost of \$39.00 per h.p. was submitted.

This is one of a group of towns that will be supplied with power from the Maitland River when the load in that district warrants the development.

Coldwater

On January 18th, 1912, a resolution was passed by the Village Council, requesting an estimate on the cost of power delivered at Coldwater, also costs of local sub-station and distributing system for lighting and power service.

An engineer made a complete investigation, and as a result it was decided to serve Coldwater with power from the Simcoe system, and that the sum of \$8,000.00 would be necessary for the purpose of building a system in the village.

On June 7th an enabling by-law was voted on, together with a money by-law to raise \$8,000.00 for a local distribution system for power and lighting service. Both by-laws carried with an overwhelming majority.

On June 25th, the contract for 250 h.p. was signed, and during the same month a construction foreman was sent to Coldwater to commence work on the local distributing system, which work was practically completed by October 1st. The work of installing interior wiring in residences and stores was begun during the early part of September, and about forty residences were completed by November 1st.

Owing to the fact that other towns in Simcoe County have voted on and contracted for the securing of power, the Village of Coldwater will now be served from a transmission line grouping all of these municipalities into one system, taking power from the Simcoe Railway and Power Company's plant located on the Severn River and delivered at Waubaushene. Power will be turned on in Coldwater about January 1st, 1913.

Collingwood

Estimates were made of the cost of power delivered to Collingwood from different sources, but after considerable investigation an estimate was given to the town on the cost of 700 h.p. at 2,200 volts, delivered in Collingwood from a line tapping the Simcoe Railway and Power Company's system near Waubauskene.

Copetown

See Report on West Flamboro.

Courtland

On November 22nd, 1911, a deputation from Courtland called in connection with the cost of power at Courtland. The whole situation was explained to them, but owing to the small demand it is not probable that the matter will be actively taken up at present.

Crediton

The enabling by-law was submitted to the ratepayers of Crediton at the Municipal Elections in January, and passed by a large majority.

Creemore

On August 8th an inquiry was received from Creemore in regard to Hydro-Electric power, and in September arrangements were made to investigate the local conditions.

In August a vote was taken and passed on the question of granting a franchise to a private corporation, to construct an electric railway, water mains, gas lines, and electric lines on certain highways in the township.

Dashwood

The enabling by-law was submitted to the ratepayers of Dashwood at the Municipal Elections in January, and carried.

Dereham Township

A letter, dated December 19th, 1911, was received from Dereham Township, stating that a petition had been received by the Municipal Council from several ratepayers, asking for an estimate of the cost of Hydro-Electric power. A reply to this letter was sent on December 27th, instructing them in regard to the procedure to be followed.

Doon

The Doon Twines, Limited, asked for an estimate on the cost of 100 h.p. delivered at their factory near Preston. Estimates were made up on a supply of power at 6,600 volts, and given to the Company, and a contract was signed by them, agreeing to take 100 h.p. at \$34.00 per h.p. per year at 6,600 volts.

Specifications were drawn up for the equipment to be installed in the consumer's station, and contracts were let for all of the equipment. The line is being built and power will be furnished early in the winter.

Downie Township

On January 17th a representative visited Sebringville, to attend a public meeting in reference to Hydro-Electric power in that district. A committee was formed to actively canvass Downie and Ellice Townships. Petition forms and all necessary information were sent to the Secretary of the Committee on January 29th.

In reply to a letter, dated February 6th, a description of the method of distribution in townships was sent, also maps of the township were made showing roads available for the rural distribution.

A petition from the Township Council, asking for the cost of power and estimates of the cost of distributing power to the petitioners was received, and estimates are being made.

Drumbo

On October 31st an engineer visited the various villages in Blenheim Township. His report showed the total load at Drumbo to be 70-80 h.p., and the probable Hydro-Electric load which could be obtained 30-35 h.p.

Estimates of the cost of supplying power to the various villages in Blenheim Township were made.

Dublin

Inquiries having been received from the Police Village of Dublin in reference to obtaining a supply of Hydro-Electric power, a representative made a study of the local conditions during July. From the data obtained a report was submitted, covering a proposed distribution system for the village, together with which blank petition forms were sent for circulation among the residents, and instructions given as to further procedure on their part.

Dundas

During the past year the number of services has increased gradually until some two hundred and seventy customers are now supplied. No lines were built until a load had been secured to cover the cost of each extension, which has resulted in the system being self-sustaining even without a street light or town pumping load. The present street lighting contract expires at the end of this year, and arrangements are being made to instal an up-to-date town system. The officials also expect a load from a proposed town pumping plant where a synchronous motor will probably be installed for power factor correction. The control of the system has been handled by a committee of the Town Council, but a commission will be appointed the first of the year. The peak load at present amounts to about 585 h.p.

At the request of the town officials, a demonstration of the uses of electricity in the household and on the farm was given in the town at the end of October.

The town has been visited frequently during the year, and assistance given the local officials with contracts for new business, lawing out the extensions and assisting new customers in the purchase of their equipment.

Dunnville

Acting upon the directions of the Municipal Council, the Town Clerk of Dunnville wrote on February 21st, asking that estimates of the cost of installing a distributing system for Hydro-Electric power be submitted. On February 28th, a deputation interviewed the Chairman and members of the Engineering Department relative to Hydro-Electric matters, and instructions were given to prepare estimates of the cost of supplying 550 h.p., in addition to estimates for 350 h.p. previously called for.

On March 4th and 5th a representative made a thorough study of the situations and the requirements there. On the basis of the information obtained, estimates were made of the cost of a distribution system for the town. These estimates include station equipment, and were forwarded to the Mayor on May 11th.

Dunwich Township

In reply to an enquiry asking for a copy of the Act and other information in connection with Hydro-Electric power, a letter, dated December 2nd, 1911, was forwarded to the Township Clerk, enclosing the desired information.

On December 18th, 1911, a letter was received from the Clerk, stating that a resolution had been passed by the Municipal Council of Dunwich, authorizing him to make inquiries relative to a power supply for Dunwich Township.

Dutton

On December 21st, 1911, a letter was sent to the Town Clerk of Dutton, with a resolution form and all information necessary in regard to the procedure for applying for a supply of power.

Estimates were prepared for supplying Dutton with 150 h.p., in conjunction with West Lorne and Rodney, each taking 150 h.p.

A meeting of delegates from West Lorne, Rodney, Sheddon and Dutton, to talk over the situation with a representative of the Commission, was held on May 21st.

Two additional estimates for the cost of power to the towns in this district were made in June.

East Flamboro

The Township Council sent in a petition from some eight residents near Waterdown Village, asking for an estimate on the cost of service. This was returned for more information, and the Clerk was also advised to communicate at once if others desired service, so they might be considered with the applicants of the adjacent townships. A large fruit farm near Waterdown desired a supply of power, and as there were no further applicants the village was informed that the above customers could be supplied by them over a line to be built, as soon as the village stated that they would be responsible for the interest and sinking fund charges on any money expended in connection with the construction. The district was visited, and from the data obtained the required estimate was made up, but when it was found that only two of the first really desired service and that they were so far from the existing Waterdown line that the cost to them alone would be too high, the matter was dropped until a larger number in the district apply for service. The proprietors of the fruit farm were satisfied with the estimate, and the line will probably be built to them at once.

The Dominion Sewer Pipe Company's plant near the G. T. R. has been visited frequently, and they have been advised and assisted in laying out and purchasing equipment for extensions for their work. The connected load on the plant having increased from 150 h.p. to 275 h.p., has necessitated changing the station layout and installing a panel, so that their supply is entirely separate from Waterdown Village.

The load on the Waterdown line during October of the present year reached 167.5 h.p.

Elmira

The Village of Elmira had previously passed their enabling by-law, but up to October of the present year no further action had been taken on the part of the village. On the 9th of that month a resolution of the Village Council asked that estimates be prepared of the cost of installing a distribution system, covering power, house lighting and street lighting service. Accordingly, the place was visited,

and from the data obtained the required estimate was made up and submitted to them for consideration. At the same time they were given an estimate of the cost of power to the village of \$38.00 per h.p. per year on the basis of 225 h.p. being used, which power would be delivered at a voltage suitable for location distribution.

Elmvale

In the spring of 1912 the Police Trustees of the Village of Elmvale inquired as to the most suitable method of securing Hydro power for the village, and sought information respecting the taking over of the private plant which was then furnishing their lighting service.

Investigation revealed the fact that the village could be most suitably served from the transmission line about to be built from Waubauskene to Barrie, power being obtained from the Simcoe Railway and Power Company.

During the months of July and August the necessary expenditure required to remodel the local distributing system, install a modern series of tungsten street lighting service, and provide station equipment for the control of same was determined. The amount needed was found to be \$4,853.00.

The Trustees of the village decided to purchase the distribution portion of the plant in the village and to submit to the people the enabling by-law, also a by-law to raise \$7,000.00 in debentures to provide for purchasing the line portion of the old plant and to remodel the same for receiving Hydro power.

These by-laws were voted for on October 21st, 1912, and carried almost unanimously.

Arrangements were made for starting construction work on the local sub-station and distribution system in order to deliver the Hydro service to Elmvale during the early part of the new year.

Embro

An estimate on 125 h.p. for the Village of Embro was prepared and submitted on December 14th, 1911.

On May 23rd a letter was written to the Clerk, stating that it had been estimated that 125 h.p. could be supplied to the village for \$43.60 per h.p. power to be delivered at a voltage suitable for distribution.

Englehart

The Town of Englehart being about to sign a contract with a power company for a supply of electric power, submitted the same on August 4th for advice. The required report was made and submitted.

Eramosa Township

On November 7th, 1911, the Township Clerk forwarded a petition from the residents of Rockwood.

A copy of the Act and by-law and all necessary information in regard to the same were forwarded to the Clerk on November 20th, 1911.

On December 11th, 1911, an estimate of cost of 50 h.p. was made on the basis of Acton using 200 h.p. This estimate was forwarded to the Police Trustees of the village. The by-law was carried at the Municipal Elections.

Etobicoke

Petitions were received from the Township of Etobicoke, asking for an estimate of the cost of power to residents near Thistleton and Islington, together with some scattered over districts north of Mimico. A special study is being made of the conditions existing in this township with the object of giving power to the various applicants, and it is hoped that the required information may be furnished in the near future.

Exeter

This town passed the enabling by-law the first of the year. Various estimates on the price of power have been made up for Exeter in conjunction with the other municipalities in Huron County.

Fergus

At the request of the Village Council, Fergus was visited on May 3rd, in order that the Commission might be in a position to advise as to the best site for their proposed water works station.

A report was made and forwarded to the Council.

Fingal

An application for electric power for the Village of Fingal, and the Township, was received December 7th, 1911.

Petition forms were forwarded for circulation in the village and adjoining district, and then returned for an estimate of the cost of service.

This estimate is now being prepared.

Forest

On April 17th the Town of Forest was visited and a detailed report made on the present power plant. Investigations were also made as to the possibilities for increase in their power load.

Galt

Extensive additions to the street lighting have been made during the current year. The cluster street lights have been almost entirely replaced with single-light brackets operated from series regulators. In the residence district much headway has been made in installing a multiple system of ornamental standards, and it is expected that all wires, both telephone and lighting, will be placed underground; ducts for these have been installed.

The power load is growing as steadily as the lighting load. An additional 15 per cent. discount was granted to consumers during the current year—the earnings having shown this to be justified. Orders have been placed for additions to the switchboard equipment, these being necessitated by the increasing light and power load. The Water Works Commission, in conjunction with the Lighting Department, has purchased a synchronous motor driving two centrifugal pumps, to be installed in the water works plant; this motor is being used to correct the power factor for the Electrical Department at times of peak load.

General satisfaction has been expressed over operations in Galt. The prospects are very bright for a steady increase in both light and power loads.

Maximum Load, October, 1911.....	335	h.p.
“ “ “ 1912.....	643.5	h.p.

Georgetown

A resolution was passed by the Municipal Council of Georgetown on April 8th, 1912, asking that an estimate on the cost of power delivered to the village, and also one on the cost of a distributing system, be submitted. An estimate of the cost of 200 h.p., at 2,200 volts, was forwarded to the Council on May 16th. In October, it was decided that a by-law be placed before the people to enable the village to enter into a contract, and also a second by-law to raise \$20,000.00 for the reconstruction of a local distribution system. It was also decided that the vote on both by-laws be taken on November 11th, 1912.

Glencoe

Upon a request from the village a representative visited Glencoe in May, and reported on the present equipment and the probable load. Estimates have been prepared and are being revised. These will be forwarded as soon as completed.

Glen Williams

On November 9th, 1911, Glen Williams was visited, and information was obtained to the effect that 40 h.p. could be utilized at once and 50-60 h.p. additional in about twelve months time. There would also be a demand for lighting service.

Gloucester Township

At the request of the Township Council of Gloucester a proposed agreement between the township and the Ottawa Electric Co. was gone carefully through and reported on, certain modifications being recommended.

Goderich

The enabling by-law was passed the first of the year, and since then the proposition of Hydro power has been discussed with the Council and the Board of Trade at various times. A number of estimates have been submitted on feeding the Huron County municipalities from the Niagara Falls system, via Stratford, also on the combination of Niagara and Maitland powers.

These estimates show that when the amount of power required in Huron County is sufficient to warrant the development of the Maitland River, this district would have power at a very cheap rate. In the meantime, power would be supplied from Niagara, which will enable the towns to build up their loads.

Goderich is to vote on a money by-law on January 6th, 1913, to cover the cost of reconstructing their present distribution system to receive and distribute Hydro power.

A new electrically driven water pump is to be installed, their present powerhouse remodeled and ornamental street lights placed in the centre of the town. Goderich has been working in conjunction with the other municipalities in Huron County, and before presenting the by-law the Council attended a meeting of Huron County delegates at Clinton where the whole scheme was fully discussed, representatives of the Commission being present.

Grantham Township

A petition signed by some one hundred and sixty residents of Grantham Township, asking for an estimate of the cost of power to them, was received. A thorough study was made of the local conditions, and estimates are being prepared of the cost of supplying approximately 150 h.p. distributed over the district covered by the petition. Meetings were also addressed, at which the question of supplying power to rural municipalities was discussed.

Granton

On March 7th a petition was received from the Village of Granton, applying for power under the Rural Distribution Act. The local conditions and requirements of the village were looked into, and estimates are being made of the cost of supplying power to the village on a line with Ailsa Craig and Lucan.

Greenville

See Report on West Flamboro.



Municipal Distributing Station, Guelph

Grey County

In November, 1911, the various towns and villages in Grey County were visited, in connection with the proposed submission of enabling by-laws at the January Municipal Elections. The by-law was passed in Owen Sound and Thornbury. Letters were written to the other towns, urging co-operation in the matter of obtaining power and asking the Councils what action they intended to take.

Grimsby

In November, 1911, the Council of Grimsby decided to take immediate steps to submit the short form by-law at the coming Municipal Elections. This by-law carried, and estimates were made of the cost of delivering power to the following towns in the Cayuga and Grimsby district:—Hamilton, Stoney Creek, Bartonville, Fruitland, Smithville, Beamsville, Grimsby, Winona, Canboro, Dunnville, Cayuga, Caledonia and Hagersville.

Guelph

An application for power having been received from a number of residents of Guelph Township west of the city limits, Guelph was visited, and after the question had been discussed with parties interested, the result was that the Guelph Light and Heat Commission agreed to build lines and supply the required power, after having obtained the necessary permission. This permission was granted, on the understanding that the rates be submitted for approval before the work of construction is commenced.

Considerable work was done in connection with the arrangements for rates for the City of Guelph, and an engineer visited the city in connection with this work to study the local conditions.

Recommendations as to more efficient lightning protection for the city system were made in August, in order that the possibility of trouble from that cause might be reduced to a minimum.

Guelph Township

See Report on Guelph.

Hamilton

Although the construction work in the City of Hamilton was taken care of by the local municipal staff, arrangements were made whereby the plans were submitted to the Engineering Department for approval, and the various questions as they arose were discussed and a decision made. These discussions covered details of line and station construction, and also rates, accounting forms, etc.

It was decided that the construction work in the central portion of the city should be made in a temporary manner, so that it could be replaced by an underground system, and following this the question of a common conduit system for the various companies with lines in that portion of the city was discussed in accordance with the Act of 1912. The Commission met with the Dominion Railway Board, and late in the summer ordered that a common system with separate manholes was to be used by the City Electrical Department and the Dominion Power and Transmission Company.

The construction of the distribution system and the street lighting system in the other portions of the city is well under way, and a great number of power and lighting consumers have been connected to the mains. The load taken during October, 1911, by the city, has increased from 1,307 h.p. to 2,118 h.p. during October of the present year.

Hanover

In November, 1911, a letter was received from the Village of Hanover, suggesting that the Hanover water powers be taken over and developed.

A reply to this letter, discussing the situation, was sent on November 22nd, 1911, and the suggestion made that to expedite matters an enabling by-law be sub-

mitted at the January Municipal Elections. On December 14th, 1911, however, information was received from Hanover that they had decided not to submit the by-law at the present time.

A resolution, asking for information and prices, which was passed by the Hanover Council, was forwarded on January 16th, 1912, and a representative visited Hanover on February 12th, and addressed the Council on Hydro matters.

Hagersville

During the fall of 1911, a canvass was made of the possible electric load in Haldimand County, and Hagersville was one of the villages visited. It was estimated that there would be a motor load of 200 h.p., and that two quarries immediately outside the village limits were using 100 to 200 h.p. each. The Reeve and Council were assisted in presenting the matter to the people, and after an enthusiastic meeting had been held, addressed by Hon. Adam Beck, the Council passed an enabling by-law, which was submitted to the ratepayers at the annual Elections. This was passed by a large majority.

The Crown Gypsum Company, at Lythmore, signed a contract for 400 h.p. in the spring, and Hagersville requested that the necessary supply line be built, so that joint use could be made of the line as far as possible. Before this request was granted, it was necessary for them to sign a contract for a supply of power, and in order that no mistake be made, a money by-law to raise \$6,000.00 to cover the cost of a municipal system was placed before the people, and carried almost unanimously. The village was visited, estimates prepared, and the Council assisted at public meetings called to consider the matter. A detailed layout of the system proposed for the village has been prepared and submitted to the Council. It is expected that the necessary apparatus will be purchased and installed as soon as these plans have been accepted. A contract for 150 h.p. at \$33.21 was sent to the village, which has been signed and returned.

Hensall

The enabling by-law was submitted and carried at the January Elections, 1912. A report on the supply of power to Huron County was sent to the Clerk in September, and a representative was present at the meeting of Huron County delegates held at Clinton, where the supply of power for the various municipalities was fully discussed.

Harriston

The question of the town purchasing the existing electric lighting plant was discussed in November, 1911, with members of the local Municipal Lighting Commission and of the Citizens' Committee, and it was decided that the local plant should be taken over by the town. On May 3rd estimates of a complete street, residence and commercial lighting system were submitted to the town. A thorough investigation of the cost of furnishing a supply of power to Harriston in connection with the demands of the other municipalities in the same district is being made.

Hespeler

As practically all the load was connected during the previous year, few changes have occurred in this town during the current year. The lighting business shows a steady growth and general satisfaction is expressed with the operation of the local system.

Huron County

Letters were written in January, 1912, to the clerks of the various towns and villages which passed the enabling by-law, urging co-operation and asking what action the different councils intended taking. The by-law was passed by the following:—

Bayfield, Blyth, Brussels, Centralia, Clinton, Dashwood, Exeter, Goderich, Hensall, Wingham and Wroxeter.

For further information regarding these municipalities, see that given under the individual names.

Ingersoll

This was one of the first towns to be connected to the Hydro System.

In the early part of the year, the town was visited and data secured and a complete set of plans of the distribution system of the town compiled, copies of which were forwarded to them.

An inspection was made of the lines within the town and a report submitted recommending the joint use of poles with the two telephone companies on some of the streets.

Assistance was given the local commission in giving estimates of cost of power to a number of prospective power users.

The results obtained in Ingersoll have been very satisfactory, the town being well lighted and well served from an electrical standpoint. The load taken by the town has increased from 107 h.p. in October, 1911, to 482 h.p. for the last month covered by this report.

Inglewood

Several estimates of the cost of supplying power based on different premises were prepared during September, but, owing to further development, were not considered as final. Additional estimates were prepared in October which included the supply of power to Georgetown and Terra Cotta.

Kincardine

The enabling by-law was submitted to the rate-payers at the January municipal elections and carried by a large majority.

For further information, see Bruce County.

Kingston

On January 1st, 1912, the rate-payers of Kingston voted by 1,813 to 188 votes in favor of making a contract for power for distribution by their municipal system.

In January the Grand Trunk Railway Company requested information regarding a supply of power for a stone crushing plant near Kingston Mills. Estimates on power from Waddington had previously been given to the Council, and these were given to the Company. These costs were as follows:—

Kingston	Cost of Power—plus Interest—plus Maintenance	Plus Sinking Fund	Plus Depreciation
3,000 h.p.	\$24.83	\$24.47	\$30.40
4,000 h.p.	22.04	24.22	26.64
5,000 h.p.	20.43	22.24	24.25

In March the Light, Heat and Power Commission of the Council asked for quotations from the Commission and from the Electric Power Company. The above estimated costs were given to the Council. The Company also gave a proposition and these were considered by the Committee as alternative tenders. A further estimate of \$32.50 for a low voltage line was given to the Committee. These estimates included the erection of a sub-station at Kingston and the installation of the necessary equipment for the step-down station with sufficient room for the frequency changing apparatus of the City. The operation of this station was also included and the power would be delivered to the municipality at 2,200 volts.

The Committee commissioned an engineer to give a recommendation as to which proposition they would accept, and in July a report was made which included a statement that, with the existing load factor, the Municipality could not afford to buy power from the Company.

This report was under discussion for some time and finally orders were placed for auxiliary steam equipment to help carry the load over the winter peak.

Lakefield

After a preliminary investigation of the local situation had been made, the enabling by-law was submitted and passed on January 1st, and later the local Board of Trade was informed that an entirely new distribution system would cost about \$13,000.00, while about \$8,700.00 would be needed if the existing equipment were taken over; neither of these amounts includes the cost of a site for a transformer station.

Further action has been delayed, awaiting the decision of Peterboro.

Lake Shore Road

Estimates of cost were prepared in June and a contract was signed by the Toronto Golf Club for a supply of power to run a 25 h.p. pump. The service required by this contract commenced early in the summer, being supplied from Port Credit on lines carried on the Port Credit-Mimico pole line, along the Lake Shore Road.

The question of supplying several residences in the vicinity was also considered, and it is anticipated that a number will be connected.

Listowel

The enabling by-law was submitted and passed on January 1st. The estimated power requirements of the town amounted to 200 h.p. and an estimate of the cost of supplying this power was prepared.

London

During the year the growth of business in London has been very great, not only securing customers who formerly had been supplied by the Company, but, owing to the low rates quoted, securing a great number of new customers. For the nine months ending September 30th, 1912, the earnings of the Department had reached \$111,249.00, giving a profit after paying all fixed charges and a 5 per cent. depreciation charge on the cost of the system. The maximum load during October, 1911, was 1,609 h.p. and for October, 1912—2,681 h.p. The number of lighting customers at the end of the year were 4,200 with 200 power users.

There was a dispute as to the rate which should be charged by the Water Commission for the street lighting and this was finally forwarded to the Commission

for their recommendation. After a complete investigation of the costs as determined by the books and by segregating the different items of cost, a recommendation was given to the Water Commissioners as to the rate which should be charged.

Louth Township

A representative drove over part of this Township, and on October 24th addressed a meeting at St. Catharines and explained the method of procedure to obtain a supply of power, and told what was being done in equipping demonstrating farms at Ingersoll and St. Thomas to show the uses to which 2 h.p. could be put.

Committees were formed to canvass the township and application forms were left with the members of the meeting, many of whom signed at once.

Lucan

An application, dated November 16th, 1911, was received from the Village of Lucan, asking for an estimated price on 300 h.p. A reply was sent on November 20th, giving all information in regard to procedure and enclosing a copy of the by-law.

The by-law was submitted to the ratepayers at the January elections and carried by a large majority. In October a resolution of the Council was received from Lucan and Parkhill, requesting an estimate on the supply of 300 h.p. for each municipality. The matter was taken up and estimates are being prepared.

Markham

See Report on Newmarket District.

Midland

During the month of November, 1911, a 600 gallon motor-driven turbine pump was installed in the pumping station at Midland and is now handling the water supply of the town.

The operation of the Midland plant for the entire year has been most satisfactory, and the town has now 232 street lights in commission, 216 of which are series tungsten 100 watt capacity and the balance 6.6 ampere series arc lamps.

The power used during the past year has increased in connected load from 125 h.p. to 200 h.p., not including the pump motor, a total gain of 75 h.p., and the number of power customers from 8 to 16, being just double the original number.

The residential services at present connected total 420, the commercial services, such as stores, concert halls, etc., total 138 and combination residence and commercial services total 23, making a total of 581 lighting services, which, together with the 16 power services, makes a grand total of 597 customers, while the peak load has increased during the year from 222 h.p. (October, 1911) to 288 (October, 1912), a total gain of 66 h.p.

Negotiations have been under way for some time past re the annexation of what is known as "Dollar Town" to the Corporation of Midland, the ratification of the proceedings by the Municipal Railway Board being all that is needed to close the proceedings. This annexation will mean about 100 h.p. increase to the peak load during the coming year, in addition to the substantial natural growth of the present load that is anticipated.

Mildmay

See Report on Bruce County.

Milton

In response to a letter, dated January 3rd, from the Corporation of Milton, the town was visited and after investigation a report made on existing conditions and on the possible increase in demands for electric power. In this report, it was shown that the town had greatly outgrown its municipal plant and, in consequence, the service was poor. The report also pointed out that, with the low cost of Hydro-Electric power, the load might be increased from the present 70 h.p. to one of about 575 h.p.

On January 15th an application was received from the Corporation, asking for estimates on the cost of Hydro-Electric power to be supplied to that town and the cost of rebuilding and extending their distribution system to meet the new requirements.

Acting on this application, further investigations were made as well as reports made covering the various details.

On March 4th an estimate of the cost of rebuilding the distribution system was submitted and on May 16th the Municipality was given a cost of \$37.50 per h.p. per year for 500 h.p. at 13,200 volts, the town together with Rockwood, Acton and Georgetown to be supplied from the Guelph station.

In May this estimate was reduced to \$34.50 for 500 h.p. and \$30.75 for 700 h.p. at 13,200 volts on the basis of a 13½ mile spur taken from the Port Credit-Brampton line. After further information had been obtained an estimate of \$22,176.00 was submitted to the Town on October 2nd, this estimate covering the cost of rebuilding local lines, installing a new street lighting system, building lines to all power customers and installing station apparatus in a building already in use.

On October 13th the enabling by-law was submitted to the people and carried by a large majority, the vote being 189 to 4. On October 26th duplicate copies of contract were mailed to the Town Clerk. Owing to the increased use of electric power by other municipalities and the increase in the probable demand of power users to be supplied from the Milton station, this contract was made up to cover a supply of 700 h.p. at the rate of \$28.00 per h.p. per year.

In the meantime, one of the factories being in immediate need of electric power it was decided to proceed at once with a portion of the proposed changes in the local distribution system so that power might be delivered during the day from the municipal plant. Acting on a request from the Town, material for this portion of the work was ordered early in October, construction to commence as soon as the material arrives.

Acting as consulting engineers for the Town, specifications are being prepared and other steps taken for the purchase of station apparatus and for the building of the 13,200 volt transmission line. Material is also being ordered for the construction of the local distribution system.

Mimico

Previous reports record events terminating in the signing of a contract for 50 h.p. When this was done the control of the system was placed in the hands of a Commission. Materials were ordered and a construction force was turned over to the Village Commission. Early in March it was found desirable to construct lines to serve customers in portions of the Village that had not been covered by the previous estimate. To cover this extra work \$5,500.00 additional debentures were authorized by the Ontario Railway and Municipal Board. Power was supplied to

the Village circuits late in March and up to the present time some 150 customers and 75 street lights are supplied. Additional street lights are being installed at this time and more power users are being canvassed to build up the day load. The indications are that a substantial load will develop here of both day and night power.

The township surrounding the Village has been canvassed and a load of 25 h.p. is being supplied to a portion of this district at the Victoria Industrial School. (See Etobicoke Report.)

Mitchell

In the Town of Mitchell, the results obtained in their Municipal Electric Department have been very satisfactory. Their load has shown a steady healthy growth, increasing from 168 h.p. taken during October, 1911, to 201 h.p. for October of this year. The contract is for 200 h.p.

An engineer has visited the town at regular intervals to assist the superintendent in obtaining new contracts, and arranging other details. The standard system of accounting is being introduced, as also the standard method of charging for lighting and power service. The town has been taking advantage of the purchasing department of the Commission and obtain all their supplies in that way.

Nelson Township

The Council passed a resolution in November, 1911, asking that the question of power supply be taken up and estimates furnished. Later, in the present year, considerable interest was shown by the farmers in this district, some 200 of whom are expected to send in applications for power.

New Hamburg

Power for three of the largest and most important industries in New Hamburg is supplied by the Municipal Lighting Department. Much assistance has been given in securing this business. The lighting load is growing steadily and very satisfactory operation is reported for the current year. New Hamburg was originally supplied with power at 13,200 volts. Under a recent ruling, which provided that villages be supplied with power at 2,200 volts, the step-down transformers in the New Hamburg station, together with the primary oil switch and lightning arresters, have been taken over, thus relieving New Hamburg of some \$3,000.00 capital charge originally incurred. This municipality is doing a house wiring business practically at cost in the absence of a regular wiring contractor. By this means many houses have been wired with a resultant increase in lighting business.

New Toronto

See report on Etobicoke Township.

Newmarket and Newmarket District

During the summer of 1912 a union was formed of municipalities located north and northeast of Toronto for the purpose of obtaining a supply of power from Niagara Falls. To obtain data for the basis of making estimates of the cost of serving this district, the following places were visited and a thorough study made of their local conditions:—Bradford, Newmarket, Aurora, Richmond Hill, Markham, Stouffville, Uxbridge, and Port Perry.

From the information obtained, estimates were made of the cost of serving these municipalities from the transformer station near Port Credit.

Representatives visited these places and at a public meeting explained the situation to them.

Niagara Falls

In February the City Clerk wrote for estimates on power in blocks of 500 to 1,000 h.p. and estimates on the cost of 1,000, 1,200 and 1,500 h.p. were immediately submitted. No further steps were taken until October, when at the request of representatives of the Municipality the following estimated costs on 2,200 volt power delivered in the City were sent to the City Clerk, the cost including the necessary station building with all the step-down equipments:

1,000 h.p.	\$12 82	2,000 h.p.	\$12 24
1,500 h.p.	12 41	2,500 h.p.	11 99

Any greater increase in load would then require additional capacity, which would again raise the cost as follows:—

3,000 h.p.	\$12 14	4,500 h.p.	\$11 80
3,500 h.p.	12 03	5,000 h.p.	11 71
4,000 h.p.	11 90		

At the request of the City Clerk, copies of enabling by-laws and copies of the proposed power contract were also sent. Information having been furnished relative to Hydro-Electric power, a letter was received in September asking for a schedule giving estimated costs of power in blocks of from 1,000 h.p. to 5,000 h.p. advancing up steps of 500 h.p.

North Bay

The report of 1911 explains the situation in North Bay owing to the expiration of the franchise of the North Bay Light, Heat and Power Company on September 13th, 1911. As no definite decision had been made in the matter under discussion, the distribution company was given an extension of their franchise from month to month. Engineers were sent to North Bay for various conferences with the Council in the early part of 1912, and a revision of the valuation of the plant was also made. An estimate of the cost of delivering 1,250 h.p. from a proposed development at Smoky Falls was given to the Municipality, with the suggestion that temporary arrangements be made with the Power Company supplying the North Bay Light, Heat and Power Company. Rates were drawn up and recommended for use.

During the spring arrangements were made by the Power Company to take over the local distribution system from the North Bay Light, Heat and Power Company and in July the Power Company submitted a proposition to the town for a lighting franchise. After some delay the Council decided to submit to the people a by-law granting the Power Company a franchise, and, at the same time, asked them to vote upon a by-law enabling the Council to make arrangements for a supply of power with the Commission.

It was decided to submit to the people the question as to whether they should obtain a supply of power through the Commission, or turn it over to the private corporation.

Norwich

The distribution system, bought with the old plant, was rebuilt in the early part of the year, the purchase of supplies being made for the Town. Service at 2,200 volts from Woodstock was turned on on April 3rd, giving to this place for the first time an all night service for street and house lighting, as well as power.

Later, the sub-station equipment was installed and the Town was able to serve the new flour mill. Since then, with Hydro-Electric power as one of the attractions, they have secured another industry.

This is one of the places where the people appreciate the value of household utensils, such as irons, toasters, fireless cooker types of stoves, vacuum cleaners, etc. For a while a demonstration was made every Saturday afternoon and evening in one of the shop windows, some variation being made from week to week and, by this means and canvassing, those in control have been able to place several hundred pieces of labor-saving devices.

Apparatus and machinery was loaned to Norwich for use at the Fall Fair, the report in detail being included under the heading of "Exhibitions and Fairs." The results here have been good and, like a good many of the other municipalities, as soon as the power load is fully worked up, the citizens will find the result in the shape of reduced rates.

North Norwich Township

A meeting was held at Burgessville and all details of the supply of power to this township were fully discussed.

Ontario County

In connection with the application of Beaverton, Cannington and other municipalities in the County of Ontario for Hydro-Electric power, a representative visited the various municipalities in this district and made a detailed report in regard to the power question.

Letters were written to the various municipalities giving all the necessary information in regard to submitting the by-law; copies of the Act and petition forms were also forwarded.

The enabling by-law will be voted on by the ratepayers in the following municipalities. :—Beaverton, Cannington, Woodville, Sunderland and Brechin.

Orillia

During the month of January, 1912, a report was made on general conditions, power, lighting, distribution system, rates, etc. Another report was made during February by the same engineer in connection with proposed new rates in Orillia.

In July, 1912, the Town of Orillia requested the privilege of obtaining consulting advice from the Engineering Staff, this advice to be given generally from week to week or month to month as the occasions demanded. This request having been granted, the Engineering Department recommended a construction superintendent to be engaged to make a detailed report as to the changes necessary in the local distribution system to place same in a first-class condition. From this time the regular district engineer assisted the Town of Orillia to supervise the work of reconstructing their distribution system.

In August, the town requested that the purchasing department assist them in procuring their supplies, from time to time. This request was granted and from that date Orillia has been purchasing all its electrical supplies through the medium of the purchasing department.

The Town Council requested further assistance from the engineering department in connection with the method of handling small power customers. An engineer visited the town and made a careful investigation of the situation, reporting in detail on the whole question, the main feature of this report being that a secondary net-work be installed for the purpose of serving all of the small power customers in the down-town district.

On October 22nd the same engineer met the Council, together with the Water and Light Commission and supplied them with further information in connection with this matter. At this meeting the advice given was accepted and the construction work started immediately.

Ottawa

Owing to the reduction in rates made during 1911, the load increased very materially, and in February, 1912, the Municipal Electric Commission asked the Council to order an additional 200 h.p., making a total of 3,100 h.p.

The annual report issued by the Municipality shows a business of \$153,102.00 during the year, with a net profit of \$27,716.00, which was transferred to capital account for depreciation, renewals and extensions.

Otterville

Various estimates have been made for power in Otterville and the surrounding country, but no decision has been reached.

Paisley

The enabling by-law was submitted to the ratepayers at the January Election, and carried by a large majority.

For further information, see Report on Bruce County.

Paris

In anticipation of an early supply of Hydro power for Paris, estimates of the cost of power and also on necessary changes in the local distribution system and station were prepared. Much reconstruction work on the distribution system has already been done by the local superintendent with suggestions from the Commission. A system of ornamental street lighting for the main street was laid out, at the request of the local authorities. Every effort is being made to have the local system ready as soon as a supply of power is obtainable from the new Brant station. Numerous inquiries have been made for a supply of power by the various industries in Paris. The local station is loaded about to capacity, so that new business is not being sought at this time. As soon as power is available, a large number of new customers will be connected.

Parkhill

A representative visited the Village of Parkhill in April, and obtained data from which a detailed report on the local power conditions was made. A resolution of Council was received in October from Parkhill and Lucan, requesting an estimate on the supply of 300 h.p. for each of the above municipalities. The matter is at present under consideration.

Penetanguishene

During the month of November, 1911, the installation of electrical equipment in the Penetang sub-station was completed and current turned on for the first time at noon on November 27th, delivery of power to the town being officially made on December 1st. Since that time very satisfactory results have been obtained from the use of Hydro power in this town.

During January, 1912, a 600-gallon motor-driven pump was erected in the power station, the water supply for the town being handled by this unit from the date of installation.

Penetang has now in commission 161-100 watt. series tungsten street lights, 103 residential services, 88 commercial services, and 11 power customers, a total of 202 customers, with an aggregate peak load of 248 h.p. As the peak load during the first month of operation of Hydro power was only 134 h.p., the total increase in consumption aggregates 114 h.p. Without the pump motor load, Penetang has now a total connected power load of 256 h.p.

Towards the close of the past year quotations were requested and furnished on a large block of power for use in connection with two new industries, one already actually erecting their factory, and the other about to commence shortly. This additional load will give the town a very large power consumption for the coming year.

Peterboro

Peterboro voted upon and carried the enabling by-law on January 1st, 1912. Considerable work has been done in obtaining power sites on the Trent Canal, from which the various municipalities in that district could be served. Dams No. 4 and No. 8 on the canal have been leased to the Commission by the Dominion Government.

Upon the request of the Mayor of Peterboro, a valuation of the Otonabee Power Company's distribution system was made, also a valuation of the Peterboro Light, Heat and Power Company's distribution system. An estimate was then given to the city on the cost of an entirely new distribution system which would cover the city complete, including an underground system on the main business thoroughfares, a complete street lighting outfit, etc., capable of supplying all the streets of the city for power purposes, as well as residential and street lighting. The Council are submitting a by-law to the city at the coming January Elections in 1913, to raise \$120,000.00. Public meetings have been held by the Chairman and others, at which various matters have been explained.

Petersburg

Arrangements were made in the autumn to hold a demonstration of "Electricity on the Farm" on the premises of a local farmer. This demonstration was largely attended by residents of this locality, who showed great interest in the results obtained.

Plattsville

On March 8th an estimate of the cost of supplying 150 h.p. was submitted. The cost was given as \$43.85 per h.p. per year.



Standard Lighting Bracket, Port Arthur



Port Arthur

Port Arthur

During the past year a great amount of work has been done in Port Arthur on their distribution system, in order to revise it in accordance with recommendations made. A complete street lighting system has been installed, using a large number of small units. In the downtown district there are, in some cases, and on the main street, four lights to each pole on each side of the street. Port Arthur is now lighted as well as any municipality of its size in the Province. The load is growing very much, but shows judicious use of the power derived from the Current River plant, as the power purchased from the Commission has not been increased. Plans are now being made, however, to increase the station capacity and build additional lines for the supply of power to some large prospective users, which will greatly increase the amount of power purchased. The rates are being modified to agree with the standards recommended, and the financial results have been most satisfactory. The engineering department is now engaged on the plans for remodelling the equipment in the Current River plant, for increasing the size of the sub-station, for extending the transmission lines, and are also laying out the plans for the electrification of the elevator now being constructed by the Dominion Grain Commission in Port Arthur.

Port Credit

The Police Village of Port Credit was one of the first to make application for a supply of power under the Rural Distribution Act of 1911, and enabling and money by-laws were subsequently submitted to the ratepayers. These by-laws were passed for the village by the Township Council on request of the Village Trustees. The money by-law was for \$7,500.00, and covered the cost of a sub-station and distribution system throughout the greater part of the village for street and house lighting service. Public meetings were held after the details had been arranged with the Trustees, and the by-laws were carried by substantial majorities. Acting on a resolution of the Trustee Board, the necessary material was purchased and the system constructed. Before the construction force finished this work, extra material was ordered and installed on request of the Trustees, to supply additional customers, who desired service, who were located in districts not included in the original estimate. The cost of the system complete was, approximately, \$9,000.00, and a sufficient number of customers have been obtained since power was supplied on July 5th to meet all charges. Recently a number of services were installed in the township near the Toronto Golf Club. The necessary construction was erected complete and handed over to the village to operate.

Port Dalhousie

A request was received from the village, asking for an estimate on the cost of power and assistance in arranging for the purchase of a system then in operation by a local manufacturing concern. The district was visited a number of times and data obtained, and when the Ontario Power Company agreed to supply 100 h.p. at \$17.00 at 2,200 volts at their St. Catharines sub-station, this price was submitted to the village. The village then requested that a contract be prepared for the supply of power as soon as possible.

A contract was sent to them which was signed and returned, and material was ordered for the supply line to be built from St. Catharines. A superintendent was appointed by the Village Council, and he was instructed in the changes to be made

in the system that had been purchased by the village. Material was ordered for these changes, which were necessary since they were going to use 25 cycle three-phase power instead of 60 cycle single phase, for which the old system had been built. Orders were issued to rush the work on the line to St. Catharines, and the Construction Department concentrated all their available energies on the work. A spare submarine cable was loaned by the Welland Canal authorities, and power was turned on in the village on November 17th. As soon as possible the village intends reconstructing their lines to give more efficient operation.

It is anticipated that a substantial power load will develop here, and that the lighting service will be greatly increased.

Port Elgin

A report, dated May 28th, states that Port Elgin and Southampton are supplied by the Saugeen Light and Power Company, which began operations fourteen years ago and furnishes 2,200 volt power. Two years ago their generator was replaced by a 6,600 volt machine, and they erected a small transformer station in Southampton and another in Port Elgin, stepping down from 6,600 to 2,200 volts.

See Report on Bruce County.

Port Perry

See Report on Newmarket District.

Port Stanley

In the early part of this year the village distribution system was rebuilt by the Municipality under the supervision of the engineering department. As this part of the system was ready before the station equipment arrived, arrangements were made with St. Thomas for a temporary supply of 2200 volt power, service being turned on about the middle of March.

The station equipment arrived and was installed in time to care for their summer load when it came on. During the rush season the benefits of Hydro-Electric were fully appreciated; the steam plant having been outgrown, the contrast between the service from it and from Hydro-Electric was striking. Later, the lines were extended and the Beach sub-divisions taken care of, which, under the old system, were not served.

It was decided in April to install an electric pumping system with supply tank, piping, hydrants and house services. Contracts were let for the different parts of the plant and this Fall the system put into operation, thus giving another service to the residents that, without Hydro-Electric, would have been too expensive to operate.

The results in general have been very gratifying, especially so in view of the fact that it is one of the places where power cost was high.

Prescott

During the last month of 1911 an estimate of the cost of power and also of a distribution system was sent to the town. A contract for 300 h.p. at 13,200 volts at a cost of \$24.54 per h.p. per year was forwarded to the Clerk in May which was signed and returned.

Upon receipt of this contract the material for the line from Morrisburg was ordered and work was commenced. This line will be completed the first of the year 1913. Complete information and blue prints for the town distribution system were forwarded which will enable the town to order material and begin construction.

Preston

No large additions have been noted during the current year, but the load, both light and power, has grown in a very satisfactory manner. All the larger industries in Preston are using Hydro, and express great satisfaction therewith. The 3-170 k.w. station transformers being now fully loaded will shortly be supplemented by a second bank of transformers of the same size, which have been ordered.

A contract has been closed by the Commission on behalf of the town with the Doon Twines, Limited, of Doon. This load will be taken from the Preston Municipal station on a 6,600 volt line.

General satisfaction is expressed with the operation of the electric light department during the current year and considerable new business is in sight. During October, 1911, the maximum load in Preston was 321.7 h.p. After twelve months' operation this load has more than doubled, reaching 657.5 h.p. during the last month covered by this report. The indications are that this load will continue to grow rapidly.

Puslinch Township

Several estimates on the cost of power to be supplied near Puslinch station, were prepared during the year and the local situation was looked into.

Richmond Hill

See Report on Newmarket District.

Rodney

Estimates were prepared on the basis of supplying this place with 150 h.p. in conjunction with West Lorne and Dutton, each taking 150 h.p.

A meeting of representatives from West Lorne, Rodney, Shedden and Dutton with one of the Commission's engineers was held in May, when the situation was discussed.

This situation will be further investigated.

See Report on Dutton.

Russell

Upon a request of the Trustees of the Police Village of Russell, an engineer addressed a meeting of the ratepayers explaining the policy of the Commission.

Later, estimates were prepared for the district and a price of \$28.00 per h.p. per year for 750 h.p. was submitted. Plans of the village were obtained and an estimate for a distribution system was prepared and forwarded.

Sandwich

See Report on Windsor.

Scarboro Township

A petition was received from the Township of Scarboro asking for an estimate of the cost of power to the township under the Rural Distribution Act, 1911. As a result of this application, a study is being made of the conditions to be met, with the idea of submitting them an estimated cost covering the most advantageous system of distribution. The petition covered practically the whole of the township. A number of conferences were held with officials of the township for the purpose of assisting them in circulating their petition and also of discussing the various conditions with them.

Seaforth

The work of completing the municipal system for the town was rushed along under supervision, the material being ordered through the Purchasing Department.

By May everything was working quite satisfactorily, new users coming on and new street lighting being installed rapidly. It is expected that a reduction of rates to the light users will take place next year.

During the last month covered by this report the Town of Seaforth took a load of 242 h.p.

Sebringville

Several estimates of the cost of supplying power were prepared in the early part of the year, and, on June 6th, Sebringville was informed that the cost would be \$48.10 per h.p. per year, on the basis of 50 h.p. being contracted for, power to be delivered to the village at a voltage suitable for distribution.

Shedden

The possibilities here were investigated in connection with Dutton, Rodney, and West Lorne. Representatives from Shedden attended the meeting held in Dutton May 21st.

The results here were the same as those noted under Shedden.

Simcoe

Estimates on the cost of power to Simcoe and several other places in the vicinity were prepared in October.

Smith's Falls

Acting on a request from the Board of Trade of Smith's Falls, asking that a report be made on their local conditions and the possibility of receiving power in conjunction with other eastern municipalities, that town was visited early in the spring, when complete data was obtained. A study was made of the operation and plant of the two existing companies in regard to the service given the customers in Smith's Falls and as to their arrangements for handling their various loads. The power requirements of the waterworks system were also carefully looked into. In addition to these, a complete study was made of the town in regard to their future requirements, and, as a result of the investigation, a complete report was made and forwarded to the town early in June, giving full details of the present state of operation and advice in regard to the handling of any future load.

Southampton

See Report on Bruce County.

South Norwich Township

A meeting of the farmers was held at Otterville and later part of the district was canvassed and a number of contracts were signed.

Sparta

An estimate was asked for in the early part of the year for serving the Village of Sparta with electric power.

This district was visited and an estimate based on the report made for furnishing this village, together with Union, was submitted. It was proposed to supply both villages from a station to be erected at the junction of the road between Sparta and Union and the Port Stanley 13,200 volt line.

No further action has been taken up to the present.

Stayner

On May 15th, 1912, Mayor Bell, of Stayner, requested, by a letter addressed to the Chairman, information *re* supplying the Town of Stayner with Hydro-Electric Power. This letter and the resultant correspondence was followed later, viz., July 20th, by a resolution of the Town Council asking for estimates on 150 and 200 h.p.

During the month of August the town was furnished with information as to the proper methods of procedure for negotiating the purchase of the private plant operating the lighting system of the town. The town was visited for the purpose of estimating on the cost of remodelling the local distribution system, and providing the necessary equipment for receiving Hydro power. As a result of this investigation, it was estimated that \$1,500.00 would be required over and above the amount to be paid for the purchase of the private plant.

On October 3rd, 1911, an engineer met the owner of the private plant in Stayner, together with the Mayor of the Town, to discuss matters pertaining to the purchase of this plant by the Municipality. On the evening of the same day a special meeting of the Council and ratepayers was held to consider the results of this conference and receive additional information *re* the supply of power from the Commission through its representative engineer.

At the present time the proposition is being considered of voting on the necessary by-laws at the coming Municipal Elections.

Stouffville

See Report of Newmarket District.

Strathroy

During November and December, 1911, various estimates were prepared for supplying power to Strathroy in conjunction with Sarnia.

A representative visited the town on May 9th and reported on the power conditions and estimates were prepared for Strathroy both individually and in conjunction with Lambeth.

Streetsville

On September 23rd Streetsville and the surrounding district was visited and a report made on the general local conditions and probable power requirements.

Meadowvale was also visited.

St. Thomas

In November, 1911, on request of the Corporation through the City Engineer, plans and specifications for a motor-driven turbine pump, capacity 2100 imp. gals. per min. for a head of 58 ft., were prepared and tenders called for from the different manufacturers and after careful consideration the contracts were awarded.

This pump was installed in the early part of the summer, permission being given to run the line to serve it over Port Stanley 13,200 volt pole line. In February the control of the Hydro-Electric system in this city was transferred from the City Engineer's Office to the Light, Heat, and Power Department.

A good deal of work was done in the earlier part of the year, giving information and estimates to the different manufacturers who were not using electric power. Results began to come in the latter part of the year, when contracts were signed by a number of large manufacturers and prospects are good for closing a number more in the near future. The new contracts and prospects amount to a connected load of about 1740 h.p.

The ratio between the average load and the maximum demand in St. Thomas has been higher than the average in the other towns and cities. Up to the present the administration of the Light, Heat, and Power Department has been by a council through a committee. It is practically decided that a commission will be elected at the next January election to take over this department.

During the past year the load taken in St. Thomas has increased from 470 h.p. in October, 1911, to 670 h.p. during the last month, a very satisfactory growth.

Sunderland

See Report on Ontario County.

Tavistock

Estimates have been given to the Council on the basis of 200 h.p. and 50 h.p. and propositions have been made to the local milling company for the use of power. The estimates of the cost of serving the village are now being revised, in accordance with the reduction in cost of power on the Niagara System, due to the greatly increased load.

Teeswater

Information was received on December 16th, 1911, to the effect that the by-law would not be submitted to the ratepayers at the coming municipal elections.

For further information, see Report on Bruce County.

Terra Cotta

Inquiries were received from the brick companies located near Terra Cotta in regard to the cost of power delivered to them. Estimates were made and submitted quoting the companies a cost of \$36.00 per h.p. per year on the basis of 150 h.p. being used.

Thamesford

The signed contract for this Police Village was forwarded on November 22nd, 1911, for 100 h.p. at \$48.73.

After some delay, owing to the fact that Thorndale was likely to come in, an engineer called on April 28th, interviewed the Secretary of the Board of Trustees, and some of the prospective power customers, and found that there is a flour and grist mill and a planing mill as possible users, besides the lighting of stores, residences and streets. The mill could not enter into a contract at this time. He called again on July 26th and found that the mill could not enter into a contract yet, owing to an option of sale having been given.

There were so many changes in the possibilities of this district from this time till the end of the year that nothing further could be done.

This contract will doubtless be carried out early in the year.

Thorndale

This town was visited on November 15th, 1911, and after those interested had been seen, the report was made that there was a demand for 160 h.p.

An estimate of the cost of a distribution system was prepared and forwarded to the Trustees on December 1st, 1911. By request of the Secretary of the Board of Trustees a meeting was held in the early part of February, 1912, and the method of procedure for submitting by-laws explained.

In March an estimate of cost for 100 h.p. of \$50.65 per h.p. per year for 2,200 volt power was given them.

In Thamesford the mill was under an option of sale for several months, and being the largest possible power consumer, retarded Hydro-Electric matters. At the end of the year a new estimate was ordered, taking into consideration the changed conditions and including the possibility of securing contracts with a large number of the petitioners from the surrounding rural district.

Tillsonburg

This is one of the towns in the zone that is being served that has natural gas for a competitor as an illuminant and power producer. In spite of this, nearly all the stores and a great number of the houses are using electric light.

The load is increasing. The Harvest Tool Company is one of the largest users, their plant being modern in its methods of manufacture throughout, and electric drive is one of the factors that make it so. Service to this plant was turned on January 5th. Most of the supplies needed have been purchased for the town for the whole of the year. In the early part of the year inspection of the town's distribution system was made and instructions given which enabled them to place their work in first class condition.

One or two manufacturing firms have been negotiating with the town, with a view to locating there, one of the attractions being Hydro-Electric power.

The demands of Tillsonburg have steadily increased from 128 h.p. in October, 1911, to 188 h.p. during the last month.

Toronto

The development of the year in Toronto is best explained by stating that during the month of October, 1911, Toronto paid for 3,318 h.p. and during the month of October, 1912, they paid for 13,037 h.p. It is expected that this demand will exceed 17,000 h.p. before the end of the year.

In November when the street lighting was taken over by the City, the demand jumped to 5,697 h.p. and has steadily increased during each succeeding month. On the first of November, there were, approximately, 12,000 users of power and light. During the summer arrangements were made between York Township Council, the Toronto Hydro-Electric Commission, and the Hydro-Electric Power Commission, whereby the portion of the Township adjacent to the City limits should be furnished with power by the City at city rates. This arrangement will help to further increase the amount of power purchased by the city.

See Report on York Township.

Toronto Township

A large petition of some 380 signers was received from this township, and some lines have been built out into the township from Port Credit. A vigorous canvass of the whole township is now being carried on and contracts are being signed by the residents.

When a certain number of contracts have been signed up, lines will be extended through the township.

Union

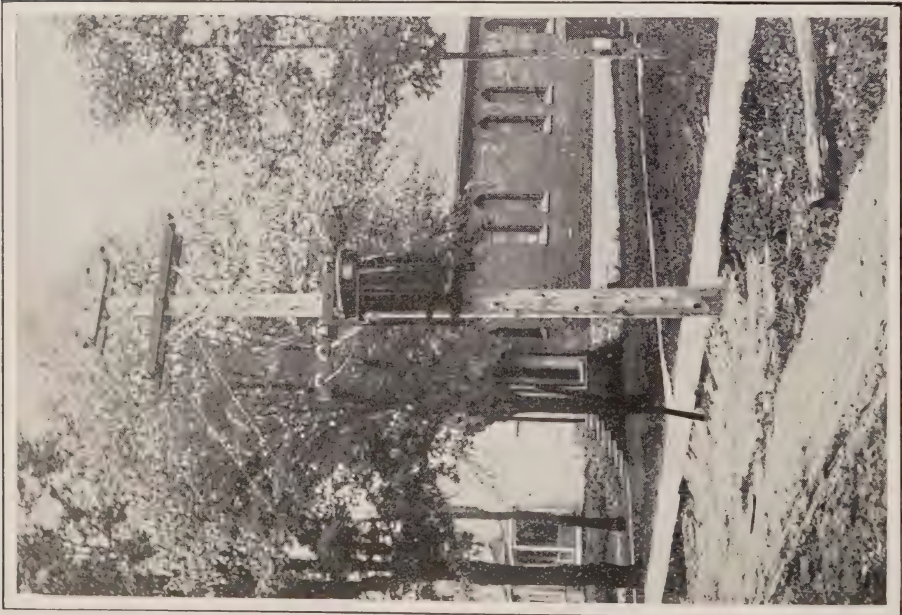
See Report on Sparta.

Uxbridge

See Report on Newmarket District.



Municipal Line Construction, Norwich



Standard Method of Mounting Transformers, Tillsonburg

Walkerton

Information was received from Walkerton on December 12th, 1911, that the Council has not yet considered the by-law, and that the same would not be submitted at the January municipal elections.

On May 14th and 15th an investigation was made of the situation and a detailed report made.

For further information, see reports on Windsor and Bruce County.

Waterdown

During the fall of 1911, a contract for 50 h.p. was presented to the Village, which was signed and returned after enabling and money by-laws had been carried by substantial majorities. Data were obtained and an estimate of \$6,500.00 was sent to the Reeve, covering the cost of installing a system. The Village decided to curtail the expenditure to \$5,000.00, which was the amount of the money by-law.

Acting on a resolution of the Council, material was purchased for the Village system and was erected in accordance with a plan approved by the Council. Two power users with a 30 and 20 h.p. motor respectively were connected and additional street lights were erected which carried the total cost of the system to almost \$7,000.00. Additional debentures for \$1,500.00 were issued on authority of the Ontario Railway and Municipal Board to cover this extra construction.

During the first months of operation only a few customers were connected, but some 55 services have been installed to date, and those in charge are much pleased with the results. Extra street lights will likely be erected in the near future and another power customer is expected before the end of the year, which will allow the rates to be lowered.

The Village has indicated that they desire to supply some customers in the township, and this request has been granted.

During the last current month the load in Waterdown reached 40 h.p.

Waterloo

A very complete system of ornamental tungsten standards has been installed on the main street of Waterloo. The use of electric light is steadily growing, and the number of power customers is also increasing, due to the excellence of the service and the efforts of the local superintendent. The local lines and apparatus in Waterloo are in first-class condition, due largely to intelligent supervision by the town authorities, who were given some assistance by the Commission's representatives.

Maximum load October, 1911—241.3 h.p.

Maximum load October, 1912—388.5 h.p.

This shows a very gratifying increase when it is recalled that many of the factories are wood-working plants. Further increase of this load is certain.

West Flamboro

Requests for estimates on the cost of power were sent in by residents of the township both direct and through the Township Council. The Clerk of the Township was asked to collect a list of all the applicants, so that they might be considered with similar requests of the adjacent townships.

Last year an engineer spent some time in the district between Dundas and Copetown, and estimates were made up for supplying various customers. Because

of the difficulty of financing and operating a system scattered over so large a territory for the small amount of load, it was not thought advisable to send out these estimates. Since this time, it has been decided to advance money to build all such lines and to turn them over to some adjacent municipality to supply and operate until such time as there is a sufficient number of similar lines in the township to make it a paying investment for the township to make a contract directly with the Commission and to do their own operating. The data have recently been gone over and revised to date, so that a line may be built out of Dundas as far as Greenville. The matter has been taken up by Dundas, which town is anxious for a supply of power for the pumping plant in Greenville, and they are prepared to be responsible for the interest and sinking fund on any money spent in erecting the system. Negotiations have been opened with the C.P.R. Telegraph Company for purchasing a portion of that Company's line through the district, which is to be transferred to a new right of way.

West Hamilton

See Report on Ancaster Township.

West Lorne

See Report on Dutton.

Welland

The question of municipal ownership having been advocated in Welland, and the matter submitted for consideration, they were advised to obtain, if possible, an agreement with the Welland Electric Company, whereby a valuation would be made of the Company's plant for the town. Failing in this, the town was advised to pass the enabling by-law authorizing the Council to enter into a contract with the Commission for a supply of power. The enabling by-law was passed at the January elections with a large majority.

The Welland Electric Company refused to come to a satisfactory arrangement in regard to the purchase of their plant, whereupon the town requested that an estimate of the cost of providing a distribution system be submitted. The town was visited and an estimate made giving \$45,000.00 as the amount required, which estimate was submitted to the town for their consideration. On August 5th a by-law was submitted to the ratepayers which was carried by a large majority, authorizing the Council to raise \$45,000.00 for the acquisition of an electrical power and lighting distribution system.

Weston

During the year the village load has increased to 100 h.p. and from present indications the rates for all classes of service will have to be reduced. An office has been opened in the Town Hall by the Water and Light Commission and the management of the plant placed on a thorough business-like basis. Additional improvements are also planned. The village has been assisted in purchasing their supplies and also in securing contracts with new power customers.

Many requests have been received for a supply of power in the surrounding township and this work will be taken up in the near future.

Reports received indicate that the ratepayers are much pleased with the supply of power.

West Oxford

During the first part of the year a letter was received from the Clerk of the Township, asking for information regarding the method of procedure to secure a supply of power. An engineer called, met the Reeve and Clerk, explained to them the method of procedure and arranged to meet the Reeve later to get them started with their petitions. The petitions were not received, but a plan was sent in in the fall showing location of and amount of power needed by a number of farmers. Owing to the fairs and farm demonstrations, it was impossible to get the estimate of cost to them before this report was made.

Wiarton

On November 21st, 1911, an engineer visited Wiarton and interviewed the Chairman of the Light Committee and also the Mayor. A detailed report on the local conditions was made on December 1st, 1911, and a letter written advising the Town to submit the enabling by-law. On December 20th a representative addressed a meeting in connection with the by-law and a telegram was received on January 2nd, stating that it carried by a large majority.

Winchester

In February a request was received from Winchester, asking for an estimate on the cost of power. An Engineer was sent to make a report on the requirements of the Village and the district, and as a result, an estimated cost of \$24.00 per h.p. per year on the basis of 100 h.p. being delivered at 4,400 volts was submitted.

Acting on this estimate, the enabling by-law was passed by the Council and submitted to the people for a vote on September 28th, and was carried by 113 to 14. An estimate for a distribution system for the Village was made and forwarded.

Wingham

The enabling by-law was submitted to the ratepayers of Wingham at the January elections and carried by a large majority.

A copy of the report on the Maitland River situation was forwarded to the Town Clerk on May 18th.

Windsor

During October an investigation was made of the power situation in Windsor, Walkerville and Sandwich, in order that a revised report might be obtained covering this district. A complete canvass was made of the various power consumers in these municipalities, and from the data obtained a complete report was made.

Woodstock

A request was received in December, 1911, for an adjustment of rates for their use. Early in January new rates were recommended, and on adoption, were put into effect. This was necessary as the revenue was exceeding the cost.

During the year some assistance was given the town in connection with the effort on their part to have Dundas Street cleared of poles, and in proving to one or two of the manufacturers that the rate they are being charged is advantageous to them. Great improvement in the lighting of Dundas Street has been made by installing 48 5-lamp iron standards of a neat design. These were turned on on July 12th, by Mr. Beck, and it was made the occasion for a celebration and demon-

stration, the Park and streets leading to it being specially illuminated, a number of men prominent in the affairs of the Province being present to take part. A still further improvement is being made by installing neat pole brackets in a double row east from the point where the 5-light standards terminate. Besides these, a great many lights have been added in the districts which had not been lighted. The increase in the use of electricity in the residences both for light and for utensils has been great, as has also its use in the business places. The power load has also made some increase.

Woodville

See Report on Ontario County.

Wroxeter

In January, 1912, an enabling by-law passed by a vote of 70 to 8. The demands of this municipality have been considered in connection with those of Huron County.

See Report on Huron County.

York Township

A number of applications were received through the York Township Council, asking for house lighting and street lighting service in several districts lying outside the limits of the City of Toronto. Estimates were prepared of the cost of giving this service and an agreement was entered into with the Toronto Hydro-Electric System, whereby the System agreed to furnish the required service, the Commission bearing the cost of installing the necessary equipment, and the Toronto Hydro-Electric System paying fixed charges on such cost in addition to the cost of management, making collections, etc. Under this arrangement, construction has been started in a number of districts. Service will be given at the same rates as used in the City of Toronto.

Miscellaneous

Preliminary work for, and correspondence with, a number of other places, including the following, was commenced during the year; in some cases estimates were prepared.

Bleinheim Township
Dunbarton
Dungannon
Freelton
Fullarton
Hannon

Hawtrey
Ilderton
Glanford Township
Kemptonville
Kent Centre

Logan Township
London Township
Lucknow
Thedford
Waubushene.

MUNICIPAL ACCOUNTS

Recognizing that the success of the Hydro-Electric System, as a whole, would necessarily depend on the success of the municipal units individually, the Legislature, in 1912, gave the Hydro-Electric Power Commission control of the rates to be charged consumers by the municipalities, (Power Commission Act, Section 9, Clause 22-b), the system of accounting to the employed, (Section 9, Clause 22-b-2), and of any surplus which might accrue in the local operation, (Section 9, Clauses 22-C, a, b, c, and d), all to the end that there might be no failure to furnish service at actual cost without loss or profit.

A system of uniform accounting was prepared, based on the best judgment of electrical engineers and chartered accountants, and a copy furnished to each municipality. This is in sufficient detail to be available for the use of the largest municipality, and suitable for smaller municipalities by the elimination of some elaborate details.

A municipal auditor was added to the general staff in May, 1912, and has made an audit of the accounts of the electrical department of twenty-four municipalities, making such changes as were necessary in order to show the costs of operation and divisions of revenue, and to determine whether or not the local systems were on a self-supporting basis.

In many towns and villages, where no local Commission had been elected, the plants were still being operated as a department of the municipality, all revenue being turned in to the town or village treasurer, and all expenditures made from the common funds.

In such cases, we have opened a separate set of books for the Hydro-Electric Department, in which we charge the municipality with all revenue turned over to it and with the proper charge for street lights, at the same time crediting the municipality with all payments on account of Hydro, including the interest and sinking fund on debentures.

The annexed statement shows the results found in all the municipalities which it has been possible to reach in the limited time. The amount of fixed charges or interest and sinking fund payments on debentures is the amount actually paid by the municipality, and, in some few cases where the debentures have been issued during the past year, does not represent the total normal annual fixed charges.

The statement does not, of course, include any construction work chargeable to Capital Accounts, and shows that almost without exception the earnings have been ample to cover all expense, and that the non-user has not contributed through tax levy to the support of this enterprise.

The fixing of rates to the consumer of the various classes of service has involved a new departure in accounting in determining the unit costs. In the operation of a steam plant the principal factors are the interest on the capital investment and the amount of fuel necessary to produce each unit of current.

The Hydro-Electric System involves the sale of a service rather than a commodity, the cost being determined by the capital investment, and the maximum demand rather than the total kw-hr. or h.p. consumption. It, therefore, became necessary to determine the installation and distribution cost of each municipal plant chargeable to the four principal revenue classifications of residential lighting, commercial lighting, power and street lighting and to divide the monthly provincial power bills into the same classifications based on the relative maximum demands of each. This is a combined engineering and accounting problem which is being worked out and forms the basis of recommended rates for the different municipalities. The ultimate result of this will be that each class of service will be self-supporting, the rates being automatically adjusted to meet the actual cost of fixed charges and operating costs.

REPORT SHOWING OPERATION OF HYDRO-ELECTRIC DEPARTMENTS IN MUNICIPALITIES, BASED ON ACTUAL
EXPENDITURE AND REVENUES FOR TWELVE MONTHS

Location	Population	Total Plant Value	Total De- benture Debt and Overdraft	Operating and Maintenance Expense	Fixed charges, Interest and Sinking Fund	Total Opera- ating Ex- penses	Revenue	Surplus avail- able for plant extension and depreciation	
		\$	c.	\$	c.	\$	c.	\$	c.
Baden	800	5,235 18	5,000 00	629 47	325 26	954 73	1,148 11	193 38	
Berlin	16,000	287,897 80	236,021 26	38,970 22	15,612 53	54,582 75	74,214 74	19,631 99	
Brampton	3,500	69,077 37	65,471 89	9,207 20	223 95	9,431 15	13,246 13	3,814 98	
Dundas	4,300	32,734 01	31,000 00	2,868 70	1,172 65	4,041 25	4,940 69	899 44	
Galt	10,500	116,116 59	131,300 76	21,977 53	6,412 65	28,390 18	36,678 57	8,288 39	
Guelph	15,200	169,743 74	123,569 06	48,434 03	10,241 85	58,675 88	75,625 51	16,949 63	
Hespeler	2,500	23,613 05	20,157 03	8,607 25	2,140 21	10,747 46	10,841 71	94 25	
Ingersoll	5,000	80,947 70	89,935 16	22,186 06	5,004 97	27,191 03	28,951 61	1,760 58	
Midland	4,660	67,890 04	45,112 57	9,195 69	4,527 81	13,723 50	20,643 58	6,920 08	
London	50,000	402,253 50	393,833 38	100,811 74	23,044 66	123,856 40	141,153 16	17,296 76	
Mitchell	1,800	20,058 53	17,234 46	11,677 44	2,784 85	14,462 29	15,312 23	849 94	
Norwich	1,200	13,484 38	14,537 82	2,201 68	.....	2,201 68	2,586 58	384 90	
New Hamburg	1,500	22,866 95	21,536 95	7,567 36	1,544 27	9,111 63	11,082 62	1,970 99	
Penetang	3,568	33,357 21	30,094 94	8,933 77	1,977 68	10,911 45	12,641 24	1,729 79	
Port Credit	600	8,377 75	7,387 10	352 17	121 98	474 15	623 88	149 67	
Port Stanley	1,000	17,357 56	19,095 00	3,168 52	924 60	4,093 12	4,863 45	770 33	
Preston	4,000	68,486 80	67,096 40	18,362 20	4,110 54	22,472 74	27,558 45	5,085 71	
St. Mary's	3,500	60,713 88	52,589 65	16,195 02	4,616 15	20,811 17	19,729 98	14,044 93	
St. Thomas	14,000	122,085 08	101,271 01	32,009 02	7,398 84	39,407 86	53,452 79	1,065 88	
Seaforth	2,000	25,453 65	25,000 00	14,605 89	1,695 75	16,301 64	17,367 52	8,594 00	
Stratford	13,000	141,753 26	113,072 23	25,057 46	9,720 55	34,778 01	43,372 01	1,218 45	
Tillsonburg	2,800	32,950 58	35,685 28	14,003 59	1,780 36	15,783 95	17,002 40	1,143 10	
Waterdown	800	7,246 36	7,246 36	1,402 44	459 11	1,861 55	2,004 65	6,440 35	
Waterloo	4,500	69,084 94	56,578 06	14,313 13	3,175 04	17,488 17	23,928 52	1,716 71	
Weston	2,000	25,209 98	26,136 54	4,818 92	1,588 49	6,407 41	8,124 12	4,381 50	
Woodstock	10,000	122,330 23	82,076 05	33,314 01	7,023 04	40,337 05	44,718 55	82,123 61	
Toronto	376,538	3,734,911 33	3,647,098 95	500,564 26	144,075 68	644,639 94	726,763 55	35,069 02	
Ottawa	87,062	566,473 84	417,014 22	114,698 16	29,330 00	144,028 16	179,097 18		

MUNICIPAL RATES

In the last Report there is outlined a standard schedule of rates for power service which was adopted by a number of municipalities, and has been in use up to the present time. This schedule consisted of a series of base rates which were adopted by all the municipalities, from which was deducted a local discount which was varied according as the costs of service to the municipalities were greater or less.

These base rates consisted of certain flat rates varying by a series of steps from \$50.00 per h.p. per year for users taking 3 h.p. or less down to \$40.00 per h.p. per year for 101 h.p. users or greater. As an alternative to the flat rate there was a differential rate, consisting of service charges varying from \$15.00 per h.p. per year for small users down to \$12.00 per h.p. per year for large, together with which were consumption charges varying from 3.5c. per kw.-hr. for small users down to 1.25c. per kw.-hr. for large, the changes in service and consumption charges being coincident and forming a series of steps. The local discounts used with this schedule of base rates varied from $33\frac{1}{3}$ per cent. in Dundas down to nothing in St. Thomas, St. Mary's and Stratford.

The Toronto Hydro-Electric System developed a schedule of power rates intended to give a scale of charges eliminating all steps, the principle of which was adopted and recommended to some of the other municipalities for their own use. This schedule consisted of two service charges and three consumption charges. The consumption charges consisted of a monthly charge of \$1.35 per h.p. per month for the first 10 h.p. of connected load or maximum demand, and \$1.00 per h.p. per month for all additional load. The consumption charges were made to vary in accordance with the cost of delivering power to consumers in each municipality and to have a ratio to each other of 3 to 2 to 1. The first consumption charge was used for all consumption up to the first 50 hours monthly use of load, the second charge for all additional consumption up to second 50 hours monthly use, and the third charge for all additional consumption. Rate schedules formed after this plan were used without any local discount.

In some municipalities using this system a schedule of flat rates was also used. This flat rate consisted of two charges having a ratio to one another of 1.35 to 1, the first charge for the first 10 h.p. of connected load or maximum load and the second for all additional load.

In applying these different rates in the various municipalities, it was the intention that the differential system of charge should be used with all customers whose monthly bills should be less than the flat rate when based on actual use, while the flat rate was to apply to customers having good load factors.

During the past year the question of rates has been given much study, and it was decided, after checking the results secured in a number of municipalities with the recommendations made by electrical associations and various public service commissions, that the flat rate of charge should be entirely abandoned. A new schedule was drawn up along the lines of the Toronto system of charge with the exception that the ratio of consumption charges was changed from 3.2-1 to the ratio 12-8-1, the consumption charges as before, being varied in accordance with the cost of service in each municipality. With base rates made after this latter plan the same class discounts are used as with all previous schedules, viz:—

Class "A":—24 hour unrestricted use—No discount.

Class "B":—24 hour restricted use—10 per cent. discount.

Class "C":—10 hour unrestricted use—10 per cent. discount.

Class "D":—10 hour restricted use—33⅓ per cent. discount.

Monthly power bills are also subject to a prompt payment discount.

After using these different rates for a year or two in different municipalities, it was decided to standardize the following:—

All power users to pay on a base rate consisting of a service charge of \$1.00 per month per h.p. of connected load, or per h.p. of maximum demand where the customer installs a satisfactory maximum demand meter, and consumption charges, the three rates of which latter, being in the ratio of 12 to 8 to 1, are based on the cost of service to the municipalities. The standard class discounts are given from these rates, together with a prompt payment discount which varies slightly.

It is the intention that, at the beginning of the coming year, all municipalities that have not previously done so, will discontinue the use of the schedule of rates at present in use, whatever they may be, and adopt a schedule formed after the pattern outlined above, thus making the system of charging for power service uniform over the whole of the power union.

With the inauguration of Municipal lighting service through the Hydro-Electric Power Union, it was decided that the charge for lighting service for residential lighting should consist of two charges, viz:—A service charge based on the floor areas in the house lighted and a consumption charge based on the kw-hr. consumption, as indicated by a Watt-hour meter. For a service charge, it was decided that 4c. per 100 sq. ft. should be used in all municipalities.

The consumption charge was made very low and was varied in different municipalities in accordance with the cost of power to the municipality. Monthly bills made up on this basis were to be subject to a prompt payment discount.

In municipalities where this system of charge has been adopted, it has met with general approval, and has shown itself a most fair system of charge, both from the standpoint of the consumer and that of the municipality.

For commercial lighting it was at first decided to charge two rates based on the kw-hr. consumption as indicated by the Watt-hour meter. For all power consumed up to the first hour's daily use of demand a higher rate was to be charged, and for all additional consumption a lower rate which was to be the same as the meter rate charged to house lighting customers in the same municipality. The larger rate was at first fixed at two and one-half times the smaller rate and adopted in that form by most of the municipalities, a prompt payment discount being allowed on monthly bills. After a year's operation it was found that this system of charge was too high in that it produced too much revenue, and consequently, the higher rate has been reduced to twice the lower. This latter system, along with a prompt payment discount, is being adopted by all the municipalities.

RATES IN USE IN MUNICIPALITIES FOR POWER AND LIGHTING SERVICE

Municipality	Base Power Rates						Lighting Rates				Street Lighting		
	Flat Rates			Differential Rates			Domestic		Commercial			Prompt payment discount	
	1st ten h.p. per h.p. per year	All additional per h.p. per year	1st ten h.p. per month	All additional per h.p. per month	1st 50 hrs. per month	2nd 50 hrs. per kw-hr.	All additional per kw-hr.	Per 100 sq. ft.	Per kw-hr.	1st 30 hrs. per month per kw-hr.			All additional per kw-hr.
	Use first stand'd schedule, no local discount												
Stratford.....								4c.	4½c.	12c.	4½c.	10%	\$12.00 per 100 w. lamp.
Berlin.....					10%			5	4	12	5	10& 10	\$9.65 per 100 w. lamp.
Waterloo					10%			4	4	12	4	10	\$10.00 per 75 w. lamp; \$9.00 per 60 w. lamp.
Ingersoll					no				10		10	10	\$10.91 per 80 or 100 w. lamp.
St. Thomas.....								3	5	12	5	10	\$11.40 per 50 w.; \$12.75 per 75 w.; \$55 per Arc lamp.
St. Mary's.....								4	6	12	7	10	\$13.00 per 80 w.; \$65 per Arc lamp.
Dundas.....					33⅓%			4	3½	10	3½	10	
Woodstock.....					10%			3	4	10	4	20	
Preston					10%			4	4½	12	4½	10	\$12.00 per 40 w. or 80 w. lamp.
Hespeler.....					no				10		10	10	\$15.00 per 40 w. lamp.
Galt.....					10%			4	4	12	4	25	\$5,000 total.
Mitchell					no			Use special rates 70 c. month, min'm.					\$20.00 per 100 w. lamp.
London					10%				5		5	10	

FIRST STANDARD SCHEDULE: Base Rates for Power Service.

H.P. of Motors or Peak Load.....	1-3	4-10	11-25	26-50	51-100	101 up
Flat rate per h.p. per year, based on installed h.p. or maximum demand.....	\$50	\$48	\$45	\$43	\$41	\$40
Differential rates. Fixed charge per installed h.p. per year or maximum demand	\$15 00	\$14 40	\$13 80	\$13 20	\$12 60	\$12 00
Meter rate per kw-hr. of consumption.....	3.5c.	3.0c.	2.5c.	2.0c.	1.5c.	1.5c.

SPECIAL SCHEDULE: Base Rates for Power Service in Hamilton.

H.P. of motors or peak load	1-3	4-10	11-25	25-50	51-100	101 up
Flat rate per h.p. per year, based on installed h.p. or maximum demand.....	\$37 50	\$36 00	\$33 75	\$32 25	\$30 75	\$30 00
Differential rates, fixed charge per installed h.p. per year or maximum demand	\$6.00	\$6 40	\$6 75	\$7 50	\$8 25	\$9 00
Meter rate per kw-hr. of consumption.....	2.6c.	2.25c.	1.9c.	1.5c.	1.1c.	.95c.

No.....

Dated.....191....

NAME

APPLICATION FOR ELECTRIC POWER SERVICE.

THE UNDERSIGNED, hereinafter called the Consumer, hereby requests the
....., hereinafter called the Corporation, to make the necessary service
connections and furnish electrical energy at the premises
....., owned by The electrical
and occupied by as a
energy is required to operate
of total horse-power capacity. Maximum demand kilowatts

The Consumer and the Corporation agree to abide by the "Conditions" on the reverse hereof and to hold this Application
as a contract when signed by the Consumer and accepted by the

The Consumer further agrees to (1) take from the Corporation all the electrical energy required by Consumer for power pur-
poses for a term of one year from the date hereon and to pay monthly for such energy and service in accordance with the rates on
the reverse hereof under Class (2) to commence payments within one month from the date of connection.

SIGNED ACCEPTED FOR THE CORPORATION BY
Consumer. DATE191....

Connected Load.....Horse-power. Date Connected191....

Maximum Demand.....Kilowatts. " Meter Installed191.....No.....

RATES AND DISCOUNTS.

SERVICE CHARGE—\$1.35 per H.P. per month for the first 10 H.P. of Connected Load or Maximum demand and \$1.00 per H.P. per month for all Load in excess of this amount.

CONSUMPTION CHARGE—Up to the first 50 hours monthly, use of Load,c. per K.W.H.
Additional consumption up to the second 50 hours' use,c. per K.W.H.

Remaining consumption, - - - - -c. per K.W.H.

DISCOUNTS—Class "A," 24 hour unrestricted use; no class discount.

" "B," 24 " restricted " 10% off above rate.

" "C," 10 " unrestricted " 10% " "

" "D," 10 " restricted " 33 $\frac{1}{3}$ % " "

Less 10% on whole Bill if paid within 10 days from date of Bill.

CONDITIONS.

1. The Consumer agrees to provide convenient and safe space for the Corporation's meters (for which no rental charges will be made), wires and all other appliances in said premises, and further agrees that no one who is not an agent of the Corporation or otherwise lawfully entitled to do so, shall be permitted to remove, inspect or tamper with the same, and that the properly authorized agents of the Corporation shall, at all reasonable hours, have free access to the said premises for the purpose of reading, examining, repairing or removing their said meters, wires and other material and appliances.

2. Meters and all other appliances of the Corporation, in said premises shall be in the care and in the risk of the Consumer, and if destroyed or damaged by fire, or any cause whatsoever, other than ordinary wear and tear, the Consumer shall pay to the Corporation the value of such meters and appliances, or the cost of repairing or replacing the same.

3. The Consumer hereby expressly authorizes and empowers the Corporation at its option to remove the meters and all other material and appliances installed at its expense and cut off the supply of electricity and terminate this agreement whenever any bills for said service are in arrears or upon violation by the Consumer of any of the terms and conditions of this agreement.

4. The Corporation agrees to use reasonable diligence in providing a regular and uninterrupted supply of electricity, but does not guarantee a constant supply of electricity, and will not be liable in damages to the Consumer for failure to supply electricity to said premises.

5. This agreement shall not be binding upon the Corporation until accepted by it through its proper officer, and shall not be modified or affected by any promise, agreement or representation by any agent or employee of the Corporation unless incorporated in writing into this agreement before such acceptance.

6. The Consumer agrees that on request of Corporation, he will deposit with the Corporation the sum ofdollars to be held by Corporation as a guarantee that Consumer will fulfil all the terms of this agreement.

7. The Consumer will provide all lines on the premises and all lines connecting premises with the point of delivery, and maintain the same in efficient condition with proper devices, the whole according to the requirements of the Canadian Fire Underwriters' Association.

8. This agreement shall continue in force after the term herein mentioned from year to year until terminated by a notice in writing, given by either party hereto at least one month before the end of the term or any yearly term thereafter.

9. It is agreed that the signature of the parties hereto shall be binding upon their successors or assigns, and that the vacating of the premises herein named shall not release the Consumer from this agreement, except at the option and by written consent of the Corporation.

10. If required to fix the basis of billing, the Consumer hereby authorizes the Corporation to install and repair maximum demand or curve-drawing meters, other measuring devices at Consumer's expense, or to make tests from time to time to determine the maximum amount of power used. The Consumer agrees not to make any changes in or additions to his apparatus or connected load after the same has been so determined, except with the written consent of the Corporation.

11. All electrical and mechanical equipment used by the Consumer shall be subject to the reasonable approval of the Corporation, and the Consumer shall so take and use the electrical energy as not to endanger the apparatus of the Corporation or cause any wide or abnormal fluctuations of its line voltage. All motors shall be selected with reference to securing the highest feasible power factor at all loads. Minimum power factor when operating. Consumer's maximum load shall be 80 per cent. for motors up to 10 H.P. and 85 per cent. above 10 H.P.

Form C.

NAMEResidence Class 1
Commercial " 2

No.....
Dated.....191....

APPLICATION FOR ELECTRIC LIGHTING SERVICE.

THE UNDERSIGNED, hereinafter called the Consumer, hereby requests the
....., hereinafter called the Corporation, to make the necessary service connections and
furnish electrical energy at the premiseswithin the
of, owned byand occupied by
as a The electrical energy is required to operate
Total connected kilowatts Maximum demand kilowatts.

The Consumer and the Corporation agree to abide by the "Conditions" on reverse hereof and to hold this Application as a
contract when signed by the Consumer and accepted by the
.....

The Consumer further agrees to (1) take from the Corporation all the electrical energy required by Consumer for lighting
the above premises for a term of one year from date hereof and to pay monthly for such energy and service in accordance with rates
on the reverse hereof under Class (2) to commence payments within one month from the date of connection.

SIGNED ACCEPTED FOR THE CORPORATION BY
DATE191....

Floor Area—Net.....Sq. Ft.
Installed Capacity.....Watts.

Date Connected191....
" Meter Installed191.....No.....

RATES AND DISCOUNTS.

CLASS 1—RESIDENCE LIGHTING—A Service charge of 4c. per month per 100 sq. ft. of floor area, plus a Consumption charge ofc. per Kilowatt Hour (K.W.H.)

CLASS 2—COMMERCIAL LIGHTING—For Stores, Theatres, Factories, Hotels, Offices, etc. No service charge.

Consumption charge ofc. per K.W.H. for first 30 hours' monthly use of installed capacity, andc. for each K.W.H. above.

DISCOUNTS—Less 10% on whole Bill if paid within 10 days from date of Bill.

CONDITIONS.

1. The Consumer agrees to provide convenient and safe space for the Corporation's meters (for which no rental charges will be made), wires and all other appliances in said premises, and further agrees that no one who is not an agent of the Corporation or otherwise lawfully entitled to do so, shall be permitted to remove, inspect or tamper with the same, and that the properly authorized agents of the Corporation shall, at all reasonable hours, have free access to the said premises for the purpose of reading, examining, repairing or removing their said meters, wires and other material and appliances.

2. Meters and all other appliances of the Corporation, in said premises shall be in the care and in the risk of the Consumer, and if destroyed or damaged by fire, or any cause whatsoever, other than ordinary wear and tear, the Consumer shall pay to the Corporation the value of such meters and appliances, or the cost of repairing or replacing the same.

3. The Consumer hereby expressly authorizes and empower... the Corporation at its option to remove the meters and all other material and appliances installed at its expense and cut off the supply of electricity and terminate this agreement whenever any bills for said service are in arrears or upon violation by the Consumer of any of the terms and conditions of this agreement.

4. The Corporation agrees to use reasonable diligence in providing a regular and uninterrupted supply of electricity, but does not guarantee a constant supply of electricity, and will not be liable in damages to the Consumer for failure to supply electricity to said premises.

5. This agreement shall not be binding upon the Corporation until accepted by it through its proper officer, and shall not be modified or affected by any promise, agreement or representation by any agent or employee of the Corporation unless incorporated in writing into this agreement before such acceptance.

6. The Consumer agrees that on request of Corporation, he will deposit with the Corporation the sum ofdollars to be held by Corporation as a guarantee that Consumer will fulfil all the terms of this agreement.

7. The Consumer will provide all lines on the premises and all lines connecting premises with the point of delivery, and maintain the same in efficient condition with proper devices, the whole according to the requirements of the Canadian Fire Underwriters' Association.

8. This agreement shall continue in force after the term herein mentioned from year to year until terminated by a notice in writing, given by either party hereto at least one month before the end of the term or any yearly term thereafter.

9. It is agreed that the signature of the parties hereto shall be binding upon their successors or assigns, and that the vacating of the premises herein named shall not release the Consumer from this agreement, except at the option and by written consent of the Corporation.

MUNICIPAL PURCHASES

An important branch of Municipal work is the purchase of material and apparatus for the maintenance and operation of existing lines in the sub-stations, equipment of extensions, and the apparatus and material required for Municipal Electrical Departments of the Province and many of the Provincial Institutions.

The system and the municipalities require yearly large quantities of material and apparatus. By buying in quantities for the municipalities as a whole each municipality can obtain the benefit of lower prices than could be secured by individual purchases. At the present time there are sixty-six Municipal Electrical Departments purchasing, in this manner, and with the increased quantities which may be expected with the expansion of this central buying idea, the Department will be in a position to obtain still better prices.

A new storehouse in Toronto has nearly been completed and as quickly as possible arrangements will be made to keep on hand the various material likely to be required, so that, in most cases, shipments will probably be made very promptly. The general work of the Engineering and Purchasing Staffs is covering a field ranging from the purchase and installation of the largest electrical and hydraulic apparatus for the equipment of power and lighting plants in various sub-stations and municipalities down to the minor supply items. With the advantage of complete organization, expert engineering advice is given, and the services of the Purchasing Staff offered to any of the Municipal Electrical enterprises in the Province.

A summary of the more important purchases made for the Municipalities during 1912 is approximately as follows:—

RURAL DEMONSTRATIONS

In the endeavor to get the best results from his land, the Ontario farmer has been constantly handicapped by the great scarcity of skilled farm labor. Of late years the situation appears to have grown more acute, so that at present it is difficult to obtain sufficient labor of any kind to work the larger farms in a proper manner. As a result most of the heavy work of the farm must be performed by the farmer himself. Life, in many cases, becomes a hardship, and the younger generation seize any opportunity to leave the farm for the city.

The recent introduction of the telephone and labor-saving machinery has undoubtedly relieved matters to some extent, but the farmer now demands, for many purposes, a supply of power which will be continuous, flexible and cheap, and will enable him to make use of labor-saving machines.

It is not a difficult matter to convince the farmer that electric power is the best sort of power for him to use to operate his farm machines, for from experience he is familiar with the shortcomings of the windmills, gasoline and steam engines. He is, however, unfamiliar with the extent to which he can use electric power, its measurements and its cost.

The Power Commission Act, 1911, was passed by Legislature March 24th, 1911, to facilitate the distribution of electric energy to rural districts, and the response to this in the form of inquiries and petitions was so great that it was decided to carry out an educational campaign amongst the farmers in those districts where power could be supplied at reasonable cost.

It was agreed that the best way to accomplish this was by actual demonstrations of threshing, silo filling and other adaptations. Detailed description of these demonstrations, as well as the data collected, are given later. The figures are of the utmost value in determining a basis for billing power, and have greatly aided the Commission in demonstrating to the farmer how he can arrange his work to obtain a low rate for power.

A farmer's demands for power vary throughout the year. His ordinary maximum demand may never exceed 5 h.p., but for silo filling, threshing, sawing wood, etc., he requires from 15 to 25 h.p. This is the direct result of the old methods of doing work, namely, getting along as best he can by hand or with a team of horses, and reserving all the heavy operations until such a time as he could hire a steam engine by the day to do this work in the shortest possible time.

With a steady flexible supply of power always available, these methods are both inconvenient and unnecessary. They also greatly increase the cost of supplying the district. If, however, the farmers can be induced to employ a smaller motor for a longer period, resultingly improving their load factor, it is evident that the capital cost of installation and the cost of power will be less.

Take the operation of grinding corn, oats, barley, etc., in one instance a farmer, during the winter, uses a 15 h.p. motor one hour a day for two days a month to grind 100 to 200 bushels, he also employs this same motor to saw wood, and requires 10 h.p. for two hours. It is evident that he could do this work with, say, a 4 to 5 h.p. motor and by suitable arrangements also do his silo filling and threshing. The accompanying diagram shows the typical maximum power demand for grinding and sawing wood under the old and new methods. Corn and straw cutting, it might be mentioned, require from 3 to 4 h.p.

However, for threshing and silo filling, where the large outfits are now in use, and until methods have been devised to employ the small power outfits, a 15, 20 or 25 h.p. motor and transformer to be owned by a syndicate is recommended. The power for this will be furnished to the syndicate from the distributing lines at 2,200 volts and used for heavy work. There must be enough power contracted for by the members of this syndicate to cover the demand of the large motor, while it is being used. For example: Assume that ten farmers, each contracting for 2 h.p., form a syndicate. On threshing and silo filling days the nine lend their power to the one for doing his work and he, in turn, with the eight others lends it to the next man and so on until all have finished, curtailing their individual uses so that the amount of power taken these particular days will be no greater than that allowed by contract.

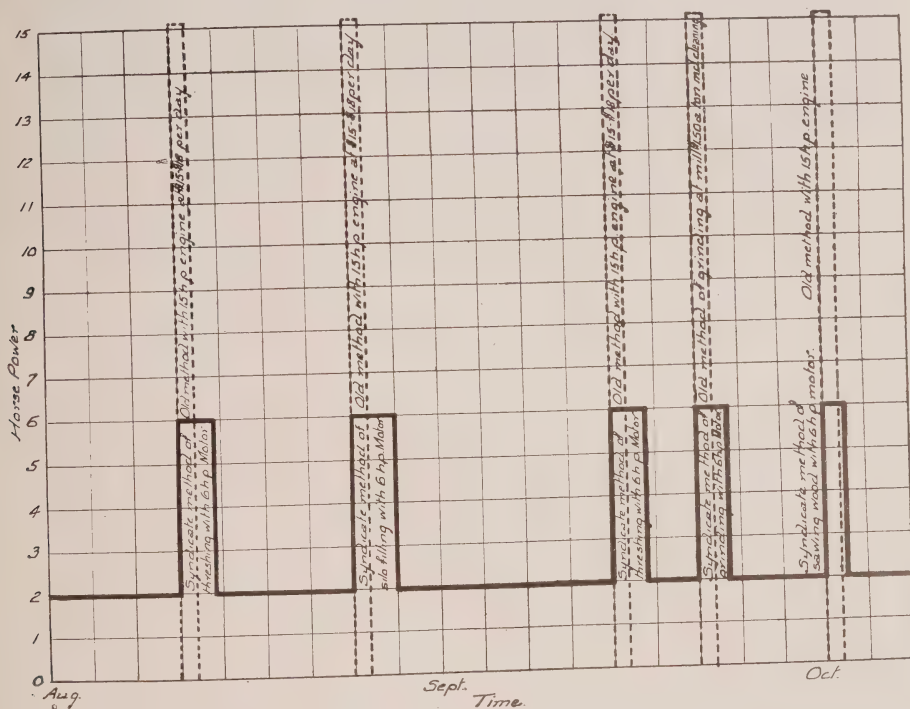


Chart showing Syndicate Methods

One of the largest associations in the United States, appreciating the possibilities of the uses of electricity on the farm, appointed Committees in 1911 and 1912 to investigate conditions. Very little was done by the Committee the first year, although letters were sent out asking for information, the object being to present reports of concrete facts to the members of the Association. Reliable data of this nature is not easily obtained, and, previous to the work of this Committee and the Hydro-Electric Power Commission, practically no data on the power requirements of farm machinery had been published in this country.

During the fall demonstrations the engineers of the Commission explained to those interested.

1. Under what conditions the Commission would deliver power.
2. How the farmers by co-operation may cheapen the cost, and finally how they could cheapen the cost by each contracting for small amounts of power and using it steadily during the day or night.

Fairs and Exhibitions

Beachville Demonstration—June 25th, 1912

The Board of Trustees of Beachville decided to celebrate the inauguration of Hydro-Electric power on June 25th, and arrangements were accordingly made with the different manufacturers for the loan of apparatus. The Methodist Church driving shed was secured for the purpose and decorated with cedar boughs, bunting and several rows of colored lamps. A few 100-watt lamps were also installed to provide illumination, and strings of colored incandescent globes and flags were suspended across the streets through the main part of the village.

A list of the apparatus exhibited is as follows:—A milking machine, automatic electric pump, cream separator, a 3 h.p. single phase motor, a 1 h.p. single phase motor, an exhaust fan, a washing machine with motor attached, an electric fireless cooker, an electric range, two vacuum cleaners, two coffee percolators, an electric soldering iron, an 8 inch fan motor, 12 in. fan motors, an electric tea kettle, a tea samovar, a 1 qt. water heater, a ½ pt. water heater, a griddle-cake cooker, a radiant grill, an electric curling iron, a cigar lighter, a chafing dish and toasters. All of the apparatus, including the range and fireless cooker, were operated. A 4-lb. roast of beef, a dozen potatoes, besides cookies, coffee, toast and tea were cooked on the two latter and served to the spectators. A cow was also milked, and the milk passed through the cream separator and the cream on to the refreshment stand, where part of it was served to the members of the Chairman's party.

Speeches were made by a number of prominent men and, after a speech by Mr. Beck, in which he explained the uses of the different apparatus on exhibition, the benefits accruing to those who use them, the possibilities in the way of serving villages and rural districts, and the many other uses of electricity, the street lights lighted for the first time.

There were about 1,700 people present, and all seemed to be very much interested in the exhibit.

Canadian National Exhibition—August 24th to September 7th

Early in the summer of 1912 the Board of Directors of the Canadian National Exhibition, recognizing the wide-spread interest of the people of the Province relative to employment of Hydro-Electric energy for various domestic and agricultural purposes, offered space for a comprehensive exhibit to demonstrate the various applications of electricity.

They allotted for the demonstration 1,800 sq. ft. of floor space in the eastern wing of the Process Building, with a frontage of 120 ft. on the main aisle and 15 ft. on the cross aisle. The exhibit was to include a representative collection of electrically operated farm and domestic appliances. The space was divided into three distinct sections: the first being employed for the office and information bureau, was designed to represent a garden pergola 15 ft. square: the second, or centre section, of 1,125 sq. ft., with a 75 ft. aisle frontage, was arranged to represent a farm yard where various machines were operated by electric motors, and the third and last section of 450 sq. ft., with an aisle frontage of 30 ft., was arranged to represent a model cottage.

The office of the booth was furnished with office furniture, and photographs hung on the wall and columns. From here literature relative to the various appliances shown in the exhibit was distributed.



Canadian National Exhibition, Toronto



Canadian National Exhibition, Toronto



Canadian National Exhibition, Toronto



Canadian National Exhibition, Toronto

The farm demonstration consisted of a 50 bu. an hour thresher, two circular ensilage cutters, a cylindrical ensilage cutter, three plate grinders of various sizes, a pulper, a refrigerating outfit, a milking machine, a grindstone, two circular saws, an automatic rotary pump, an automatic centrifugal pump, an automatic plunger pump and a windmill pump. All of these machines were demonstrated in actual operation and driven by motors ranging from $\frac{1}{4}$ to 2 h.p.

A large canvas drop representing a generating station and a rural transmission line was hung on the wall as a background.

The cottage proper consisted of three rooms, arranged to represent a dairy, a kitchen and a dining room. The dairy contained two individual electric



Canadian National Exhibition, Toronto

motor driven cream separators, a combination dairy outfit driven by a single $\frac{1}{2}$ h.p. motor and consisting of a cream separator, barrel churn, and butterworker. Needless to say, this part of the exhibit occasioned considerable interest. The machines were operated most of the time.

The model kitchen contained two types of motor driven washing machines, an electric range, an electric fireless cooker and a collection of electric flatirons, toasters, chafing dishes, immersion heaters, disc stoves, coffee percolators and tea samovars. The front part of the booth was provided with a counter and from here toast, coffee and tea prepared with the electric appliances were distributed by two demonstrators.



Canadian National Exhibition, Toronto



Canadian National Exhibition, Toronto

The dining room contained a complete set of dining room furniture and a collection of electrical appliances, consisting of a motor driven sewing machine, a number of vacuum cleaners, an ozonator, various types of air heaters, electric fans, bed warmers, etc.

From every standpoint the display was a success. The Commission was later awarded a gold medal for the exhibit. The immediate popularity which followed the opening of the display was naturally most gratifying and, for this reason, it was decided to exhibit at fairs in various parts of the Province, since it was assumed from comments that this display possessed an exceptionally high educational value.



Canadian National Exhibition, Toronto

Western Fair, London—September 10th to 14th, 1912

This fair was held Sept. 10th to 14th. It was decided to exhibit a collection of dairy apparatus, cooking utensils and small machinery in a space 60 ft. by 15 ft. secured for that purpose under the Grand Stand. The allotted space was divided into two sections.

The first section 15 ft. by 15 ft. in size was furnished as a dining room. The appliances displayed here consisted of an electric range, electric fireless cooker, coffee percolators, tea samovars, toasters of different types, electric disc stoves, chafing dishes, electric grill, electric flatirons, egg cookers, foot-warmers, luminous radiators, air heaters, motor-driven sewing machine, and a motor-driven washing machine. In another section cigar lighters and other small devices were shown.



Canadian National Exhibition, Toronto



Canadian National Exhibition, Toronto

A demonstrator was in attendance operating the electric range, fireless cooker, and different smaller devices. She also served toast, coffee, and simple dishes prepared by electricity to the interested spectators.

The second section of the booth was 45 ft. by 15 ft. in size. A large canvas drop representing a power line passing through a farming district was hung at the back and the section neatly draped with bunting.

In this section was displayed: A dairy outfit, consisting of a cream separator, a churn and a butter-worker driven by a $\frac{1}{2}$ h.p. motor; a milking machine, driven by a 2 h.p. motor; a mechanical refrigerator, driven by a 1 h.p. motor, which, besides refrigerating all the food needed for a household, supplied 10 lb. of ice per day; a large automatic rotary pumping outfit, driven by $\frac{1}{2}$ h.p. motor, capacity



Western Fair, London

300 gal. per hr.; a small automatic plunger pumping outfit, driven by a $\frac{1}{8}$ h.p. motor, capacity 125 gal. per hr.; a windmill pump fitted with jack, run by $\frac{1}{2}$ h.p. motor; a cutting-box, run by 1 h.p. motor; a turnip pulper, run by $\frac{1}{2}$ h.p. motor; a food grinder run by 2 h.p. motor, and a circular saw, run by 2 h.p. motor.

The dining-room section was lighted by a four-lamp fixture in the centre of the ceiling, the large section by 500-watt tungsten lamps and concentrating reflectors installed inside and above the opening in front of the booth, so arranged that the light was directed on the appliances and did not strike the eyes of the spectators. Brackets with 150-watt tungsten lamps and radial wave reflectors were used to illuminate a large sign outside of the booth.

In another part of the grounds, the motor and transformer wagons, known as "Outfit No. 2," were shown operating a large threshing machine. Current was sup-



Western Fair, London

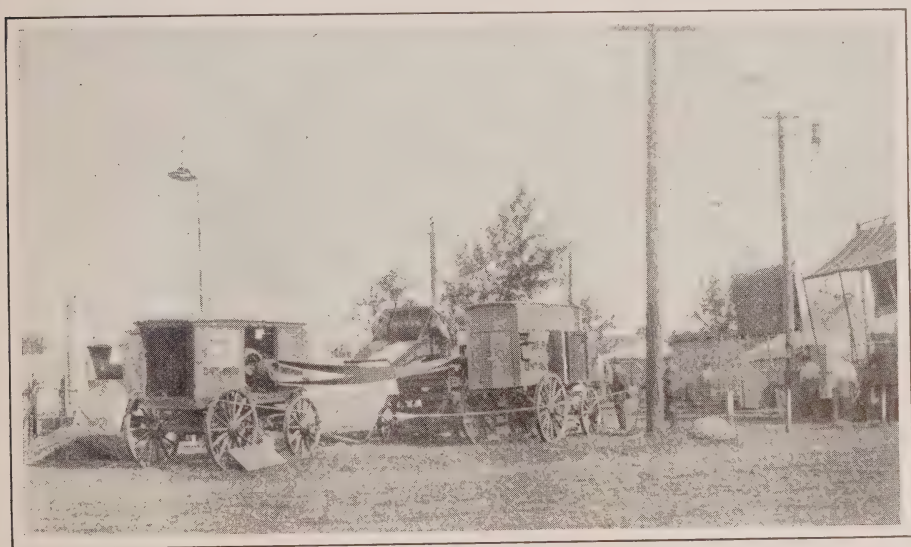


Western Fair, London

plied from the 2,200 volts mains within the grounds: The separator was driven at no load most of the time. A small German thresher, driven by a 5 h.p. motor was also shown in actual operation.

Two large banners reading: "HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO," "Portable Motor and Transformer Outfit for the Farm," were stretched across the roadway. This part of the exhibit occasioned a considerable interest and was surrounded by a large crowd most of the time. The small outfit, however, was the centre of the greatest attention, for a machine of this capacity costs very little and may therefore be purchased by the average farmer for individual use.

A great deal of interest was shown in both displays, so much so, in fact, that it kept the engineers of the Commission, as well as the representatives of the local Hydro-Electric Department, busy all day and until late at night answering all sorts



Threshing Outfit at Western Fair, London

of questions as to the possible uses of the different apparatus exhibited, and the manner in which power might be obtained in their respective localities.

Norwich Fair—September 16th and 17th, 1912

This fair was held on the 16th and 17th of September, immediately after the "Western Fair" at London. The domestic utensils and appliances were displayed on a raised platform inside the Fair Building, and consisted of a range, an electric fireless cooker, a motor-driven washing machine, vacuum cleaners, coffee percolators, electric soldering irons, fan motors, tea kettles, electric tea samovars, electric water heaters, griddle cake cookers, luminous radiators, chafing dishes, electric flat irons, electric curling irons, toasters, cigar lighters, an automatic electric pump and a cream separator.

A demonstrator was in attendance to operate the range and fireless cooker, as well as the other appliances, and explain the different uses and advantages to be derived from the use of electricity for cooking.

The farm machinery was installed in a tent outside and consisted of automatic pressure pumps, a jack for adapting the ordinary farm pump to an electric drive, a turnip pulper, a circular saw, a small thresher, and an electrically-operated milking machine. All of these were operated and attracted a great deal of attention.

Woodstock Fair—September 18th and 19th, 1912

Immediately after the Norwich Fair, the exhibit was moved to Woodstock for the 18th and 19th of September. Woodstock is the centre of an important agricultural section, and the Fall Fair is largely attended by farmers from the surrounding districts.

The display was made in a large marquee tent, and was similar to those at London and Norwich. At one end of the tent a demonstrator showed the various ways that electricity might be used in the home for cooking, heating, etc. Meals were cooked on the electric range and served to visitors. On either side of the tent churns, cream separators, a milking machine, grinders, and pumps were exhibited, operated by electric power. The small German grain separator, which had attracted so much attention at other fairs, was shown outside belted to a 3-phase 5 h.p. motor, and a load of oats was threshed during the afternoon. The cylinder of the separator was run at about 1,100 revolutions per minute, and good clean grain was obtained at the rate of 30 to 40 bushels per hour.

Weston Fair—September 28th, 1912

A demonstration was given at Weston on Sept. 28th, and in the afternoon a number of cows were milked by an electrically driven milking machine. Farmers present were well satisfied with results obtained by the machine.

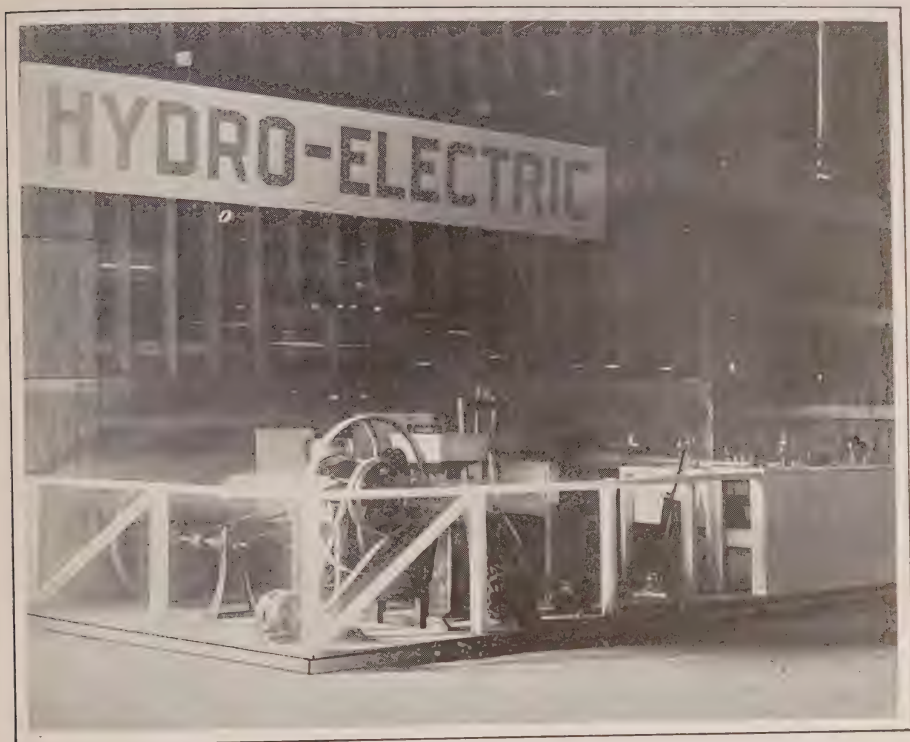
Tillsonburg Fair—October 1st and 2nd, 1912

The town of Tillsonburg held its annual Fair on October 1 and 2nd. As this is the centre of one of the best dairy sections of Ontario, the Fair was largely attended by representative dairymen, many of whom came for the express purpose of seeing the Hydro-Electric demonstration.

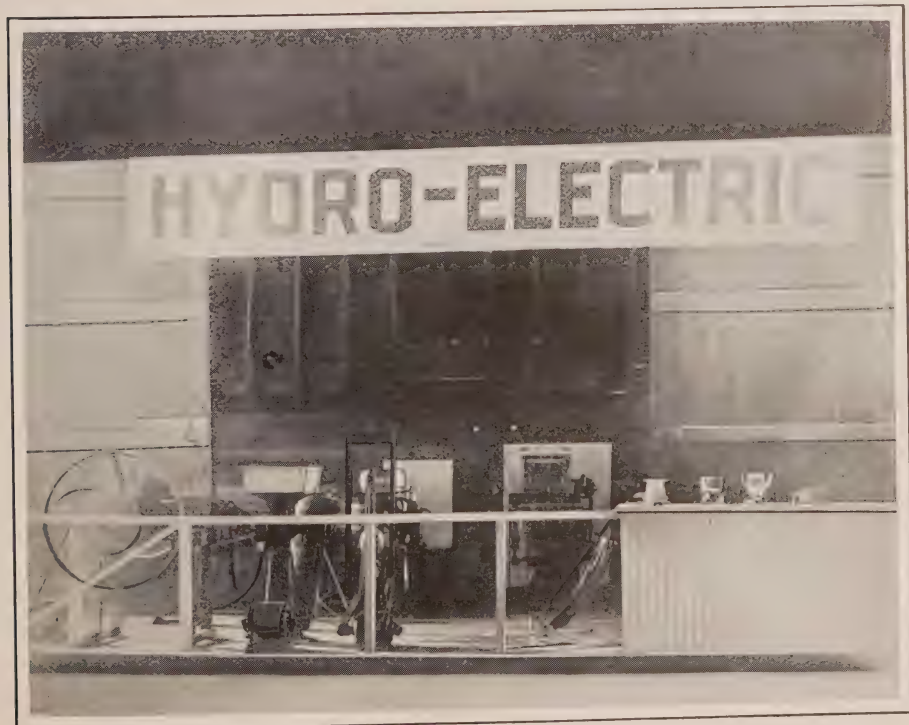
The same plan as at previous exhibitions was adopted here, the space being divided into three sections. A model electrical dairy with cream separators, butter-workers and a churn, all operated by $\frac{1}{2}$ h.p. motor, were shown in the first section. The third section held the larger farm machinery, such as grinders, circular saws driven by 2 h.p. motors and various types of pumps taking from $\frac{1}{4}$ to $\frac{1}{2}$ h.p.

Between these two sections, a model electric kitchen was built and equipped with all the latest electrical cooking and heating appliances. A demonstrator showed crowds of interested visitors the many advantages of the electrical stove, coffee percolators, toaster, etc. It was evident that to many of the women visitors the idea of electrical cooking was something entirely new.

The milking machine in the dairy section attracted the attention of many. The pumps and food grinder in the third section were also kept running, the latter operated by a 2 h.p. motor, grinding four or five bushels of oats an hour. Many questions were asked as to the method by which the farmers could secure the power in North and South Norwich and other nearby townships. Full information was furnished and petition forms and pamphlets distributed.



Markham Fair



Markham Fair—September 30th to October 3rd, 1912

A special invitation tendered by the Executive Committee of the Markham Fair Association induced the Commission to exhibit at Markham Fair. Although a demonstration had previously been considered, it was finally decided that it would be impossible to provide a comprehensive display, for the town was supplied with 133 cycle, two-phase power, and no 133 cycle motors were available.

A special booth, consisting of a platform, railing, and demonstration table, was erected and a complete dairy equipment, a straw cutter, grinder, pump, washing machine, vacuum cleaner, and an assortment of electrically operated domestic utensils shown. The uses of the latter were demonstrated, as well as those of the washing machine and vacuum cleaner, for which the 133 cycle motors were fortunately secured.

The demonstration proved exceedingly popular and occasioned an unusual amount of interest, although the exhibit was not as extensive as many of the others. The booth was erected in the skating rink, the only place available for the purpose at the time. A competent demonstrator was in charge, preparing and distributing tea, coffee, and toast.

Dundas Exhibition—October 31st to November 2nd, 1912

A demonstration was arranged for Dundas on the evenings of October 31st, November 1st, and the afternoon and evening of the 2d. A new store was secured and a suitable collection of apparatus was loaned the town for an exhibit similar to that at Norwich. The attendance was exceedingly good, people being very much interested. A demonstrator was on hand, showing the uses of each piece, besides serving tea, coffee and toast, prepared by electricity. All of the farm machinery was kept running while the exhibit was open. The farmers, especially the older men, were much interested in the simplicity of electric drives and expressed their belief that electric power would prove to be the solution to the labor problem.

Women's Institute Convention—November 14th and 15th, 1912

Arrangements were made in November for an exhibit at the annual convention of the Women's Institute at Guild Hall in the Young Women's Christian Association, Toronto.

Electrical appliances, consisting of dairy machinery, vacuum cleaners, washing and sewing machines, electric fans, heating appliances, etc., were exhibited in operation between the sessions of the Convention.

Three demonstrators, who, besides showing the uses of the apparatus, distributed a large quantity of literature, were in attendance. On the whole, the demonstration was perhaps one of the most popular of the season. The advantages of electricity in the house and the practicability of various electrically operated appliances were discussed at length at the booth and from the platform.

It might be interesting to add that, since this exhibit, the Department of Agriculture has received numerous inquiries regarding various electrically operated household appliances, and that in many sections of the Institute special committees have been appointed to secure additional information.

Demonstrations of Threshing and Silo Filling

The successful application on the European Continent of electric drive to various agricultural machines, particularly threshers and ensilage cutters, led the Commission, late in the summer of 1912, to construct two outfits similar to those used on the continent but embodying a number of minor changes to adapt them to Canadian conditions. Each outfit was composed of a covered motor wagon and a covered transformer wagon.

The wagons proper consisted of "Bain" wagon gears equipped with wagon poles and whipple-trees. The transformer wagons were provided with common wagon springs and the motor wagons with bolster springs. Experience in the field



Transformer and Motor Wagons Hauled by 50-h.p. Gasoline Truck

showed that wagons with no springs at all would have been preferable, but at the time the wagons were designed it was thought necessary to provide for the jar incident to the movement of the wagons over the country roads. All of the wagons were provided with hand brakes. Each unit weighed approximately two tons, fully equipped. The transformer wagon bodies were, roughly, 8 ft. long, 3½ ft. wide, and 5 ft. high. The gears were fitted with front wheels 30 in. in diameter and rear wheels 42 in. in diameter.

The motor wagons were slightly smaller than the transformer wagons, although they weighed, approximately, the same. The gears were provided with front wheels 24 in. in diameter and rear wheels 30 in. in diameter. The bodies were approximately 7 ft. long, 3.25 ft. wide and 4 ft. high.

The wagon frames were constructed of channel and angle iron firmly bolted together with corner and angle plates. Wood sheathing covered with canvas, the latter painted to make it waterproof, was built around the steel structure. Although these steel frames were not necessary, it was considered advisable to

employ steel rather than wood so that the transformers and other equipment might be bolted directly to the frames. Here, again, experience warranted this procedure, for one of the transformer wagons, while west of London, skidded on a muddy road and slid down a steep bank, turning completely over before it reached the bottom. The gear and body of the wagon separated, and after placing the body on skids and hauling it to a railway crane belonging to the M.C.R. it was replaced on the running gear.

Each transformer wagon was equipped with 2-15 kw. 2,200/220/110 volt 25 cycle oil-cooled transformers, connected delta to delta. Provision was made at the time the wagons were designed for three of these transformers, but, as there was no apparent need for a third, only two were installed in each wagon.



Motor Wagon Containing 25 h.p. Motor and Auto Starter

The transformers were provided with 110 and 220 volt taps on the low tension side and protected on the high tension side by automatic oil circuit breakers. The complete equipment of the wagons proper was protected against atmospheric discharge by "Garton Daniels" lightning arresters grounded through the wagon frames, a short piece of cable and an iron pin which was driven into the ground when the equipment was in operation.

The energy consumption was measured on the low tension of the transformers, on both the 110 and 220 volt circuits, with suitable integrating wattmeters permanently installed in the wagon.

The high tension windings of the transformers were connected directly to copper busses supported by single petticoat porcelain insulators mounted on a special framework in the upper part of the wagon box. These connections were made with "Dossert" covered connectors. The busses were directly connected to a



Transformer Wagon Connected to 2,200 Volt Transmission Line



Transformer Wagon and Cable Reel

plugging box mounted on the side of the wagon body into which the three leads from the 2200 volt line were connected. A second plugging box with six outlets was also mounted on the same side of the wagon and directly connected to the 110 and 220 volt taps of the transformers. The 220 and 110 volt circuits for the motor wagon, truck and other demonstrating apparatus were connected at this point. Connection to the 2200 volt line conductors was made with treated wooden poles 16 ft. long and 1½ in. diameter, topped with special spring hooks. These were hung directly upon the line. Generally, the line circuit was opened before this connection was made, but, in some cases, this was impossible and the hooks were connected to the line without first opening the circuit, since the wooden poles, even in wet weather, provided insulation.

The transformer wagons were also supplied with multiple telephone units which were connected to the line in a manner similar to the transformers. This telephone equipment was mounted on the door of the wagon in an accessible position,



En route for the Next Farm

and, with it, the wagon operator was able to communicate directly with the substation, or, when necessary, with the head office.

The motor wagons were each provided with a 25 h.p., three phase, 220 volt induction motor, connected and controlled directly by oil insulated auto-starters. There were no knife switches on the motor wagon, and the only way by which the circuit could be opened at this point was by the manual operation of the starter, by an excess amount of current tripping the overload relay or by the no voltage release on the auto starter. The motor wagon carried in the rear compartment an iron cable reel capable of holding 1500 ft. of flexible cable, which was used to connect the motor and transformer wagons by means of a special type of plug which was inserted in the receptacles and rotated 90 deg. to insure proper contact. This cable when alive was supported from the ground every 15 or 20 ft. by wooden tripods. The motor wagons were also supplied with a complete repair kit, as well as compartments for miscellaneous supplies. Portable meters were carried, and



Silo Filling with Electric Motor, Mr. S. J. Prouse's Farm, Dereham Township



3 Ton, 50-h.p. Demonstration Motor Truck

various sizes of pulleys for the motor were included in the equipment to provide proper driving speeds for the different types of threshing machines and ensilage cutters. Every possible precaution was taken to protect the operator while the outfit was in operation, provision being made so that the doors of both the motor and transformer wagons might be closed when the equipment was running.



Method of Supporting Cable between Transformer and Motor Wagons

In addition to the outfits just mentioned, a three ton 50 h.p. gasoline motor truck was purchased. The platform of this truck was 5 ft. by 13 ft. in size, and protected with a canvas top and side curtains. It was also equipped with folding running boards, which during demonstrations were used as platforms from which the operators might explain the operation of the outfit. A 15 ft. jack-shaft belt con-



Transformer Wagon Connected to Transmission Line



Open'ng Demonstration at Mr. Might's Farm, Toronto Township

nected to a 3 h.p. 110 volt, three phase induction motor was mounted on this platform and employed to operate a mechanical milking machine, a steel frame circular saw, a washing machine, a cream separator, a churn, a butter-worker, and a wind-mill pump. A 150 gal. automatic rotary pump equipped with $\frac{1}{4}$ h.p. motor and a small electric stove were included in this equipment. The truck also carried a large tent, a board floor, a demonstrating table, and a collection of heating devices packed in special carrying cases. During the demonstrations last Fall this truck accompanied the motor and transformer wagon known as "Outfit No. 1." Generally, the motor and transformer wagons of the outfit were hauled from place to



Rural Demonstration, St. Thomas

place with horses, but in one or two instances when horses were not available they were hauled by the truck.

The first demonstration with these outfits was held at Mr. Might's farm in Toronto township, on August 28th, in the presence of Hon. Adam Beck, Hon. J. S. Duff, Minister of Agriculture, other Members of the Cabinet and Officials of Toronto township.

The motor wagon was employed to drive a grain separator. Different farm machines on the truck were also operated. During the demonstration an expert demonstrator served toast, coffee and tea, prepared on electric appliances, and demonstrated the uses of the vacuum cleaner, washing machine, bed-warmer, etc.



Milking Cow with Electrically Driven Milking Machine



Engine Replaced by Electric Motor for Threshing

Demonstrations were then made at the following places on the dates named :

Mr. O'Leary's farm, in Toronto Township.—Aug. 30th.

Mr. Sipes' farm, in North Dumfries Township, near Blair.—Sept. 4th.

Mr. Shaefer's farm, in North Dumfries Township, near Berlin.—Sept. 6th.

Mr. Knipfel's farm, in Wilmot Township, near Petersburg.—Sept. 9-12.

Mr. Christian Hostetter's farm, in Wilmot Township.—Sept. 11th.

Wilmot Fair, at New Hamburg.—Sept. 13th.

Mr. Philip Kenney's farm, in Hibbert Township, near Dublin.—Sept. 16-17.

Stratford Fair.—Sept. 19-20.

St. Mary's Fair.—Sept. 24-25.

London Sanitarium.—Sept. 30, Oct. 1.

Mr. Alex. Anderson's farm, in S. Yarmouth Township, near St. Thomas.—Oct. 5-8.

Mr. McKenzie's farm, in S. Yarmouth Township, near St. Thomas.—Oct. 11, 12, 14.



5-h.p. Motor Installation for Silo Filling

After exhibiting "Outfit No. 2" at London Fair, it was employed at the following places for the purpose of demonstrating the superiority of the electric motor over the steam, gasoline, and oil engines now in general use for threshing, silo-filling, and other work on the farm. During these demonstrations data was collected which appears later in this report.

Mr. John Prouse's farm, in W. Oxford Township, near Ingersoll.—Sept. 14, 16, 17; Oct. 5, 7, 8.

Mr. Wm. Bowman's farm, in Dereham Township, near Ingersoll.—Sept. 17-18; Oct. 9-12.

Mr. Geo. Raymond's farm, in N. Oxford, near Ingersoll.—Sept. 19-20.

Mr. Jas. Pordon's farm, in N. Oxford Township, near Beachville.—Sept. 21-23.

Mr. John Karn's farm, in W. Oxford Township, near Woodstock.—Sept. 24-26.

Mr. Jas. Innes' farm, in W. Oxford Township, near Woodstock.—Oct. 1-3; Sept. 27, 28, 30.

Mr. Michael Furlong's farm, in N. Norwich Township, near Norwich.—Oct. 21-23.
 Mr. S. J. Prouse's farm, in Dereham Township, near Ingersoll.—Oct. 14-16.
 Mr. John Leigh's farm, in W. Oxford Township, near Ingersoll.—Oct. 17, 18.
 Mr. Chas. Fletcher's farm, in N. Norwich Township, near Norwich.—Oct. 24-26;
 Nov. 18-20.
 Mr. Barney Smith's farm, in S. Norwich, near Tillsonburg.—Oct. 30, 31; Nov. 1-8.

Following is a list of the operations performed at each place, and the field data secured:

John Prouse, West Oxford

(Sept. 14, 16, 17; Oct. 5-8.)

Threshing—Wheat.

Bushels of Wheat	265
Total time (deductions made for delays)	4 hr. 16 min.
Kw.-hr.	87
Average h.p.	27.2
Bushels per hr.	62.2
Bushels per kw.-hr.	3.04

Threshing—Oats.

Bushels of Oats	1,179
Total time (deductions made for delays)	11 hr. 15 min.
Kw.-hr.	165
Average h.p.	19.6
Bushels per hr.	104.8
Bushels per kw.-hr.	7.14

Silo Filling.

Size of Silo	33 ft. by 29 ft. by 13½ ft.
Quantity put in	270 tons
Total time (deductions made for delays)	18 hr. 35 min.
Kw.-hr.	367
Average h.p.	24.5
Tons per hr.	14.5
Lb. per kw.-hr.	1,471

Wm. Bowman, Jr., Dereham

(Sept. 17, 18; Oct. 9-11.)

Threshing—Oats.

Bushels of Oats	1,190
Total time (deductions made for delays)	8 hr. 20 min.
Kw.-hr.	141
Average h.p.	22.2
Bushels per hr.	143
Bushels per kw.-hr.	7.5

Silo Filling.

Size of Silo	15 ft. by 40 ft.
Type of box used	Blizzard No. 3
Quantity put in	175 tons
Total time (deductions made for delays)	20 hr. 3 min.
Kw.-hr.	336
Average h.p.	22.4
Tons per hr.	8.75
Lb. per kw.-hr.	1,041

Geo. Raymond, S. Oxford

(Sept. 19-20.)

Threshing—Oats.

Bushels of Oats	1,140
Total time (deductions made for delays)	6 hr. 52 min.
Kw.-hr.	203
Average h.p.	24.5
Bushels per hr.	162
Bushels per kw.-hr.	5.36

Jas. Fordon, N. Oxford

(Sept. 21-23.)

Silo Filling.

Size of Silo (filled, 32')	14 ft. by 40 ft.
Type of cutting box	Blizzard No. 3
Quantity put in	125 tons
Total time (deductions made for delays)	10 hr. 15 min.
Kw.-hr.	1.97
Average h.p.	25.5
Tons per hr.	12.4
Lb. per kw.-hr.	1,268

John Karn, W. Oxford

(Sept. 24-26.)

Threshing—Oats.

Bushels of Oats	1,450
Time running (deductions made for delays)	7 hr. 35 min.
Kw.-hr.	198
Average h.p.	24.8
Bushels per hr.	191
Bushels per kw.-hr.	7.8

Jas. Innes, W. Oxford

(Sept. 24, 26-28; Oct. 1-3.)

Threshing—Wheat.

Bushels of Wheat	476
Time running (deductions made for delays)	5 hr. 5 min.
Kw.-hr.	92½
Average h.p.	24.3
Bushels per hr.	93.3
Bushels per kw.-hr.	5.15

Threshing—Oats.

Bushels of Oats	2,180
Time running (deductions made for delays)	13 hr. 35 min.
Kw.-hr.	325.5
Average h.p.	24.4
Bushels per hr.	165
Bushels per kw.-hr.	6.69

Silo Filling.

Size of Silo (filled, 37½')	16 ft. by 45 ft.
Quantity put in	152½ tons
Total time (deductions made for delays)	16 hr. 40 min.
Kw.-hr.	275
Average h.p.	22
Tons per hr.	9.51
Lb. per kw.-hr.	1,109

S. J. Prouse, Dereham

(Oct. 14-16.)

Silo Filling.

Size of Silo	16 ft. by 40 ft.
Type of box used	Blizzard No. 3
Quantity put in	189 tons
Total time (deductions made for delays)	20 hr. 15 min.
Kw.-hr.	392
Average h.p.	19.6
Tons per hr.	8.4
Lb. per kw.-hr.	939

John Leigh, West Oxford

(Oct. 17, 18.)

Silo Filling.

Size of Silo	14 ft. by 35 ft.
Quantity put in	108 tons
Total time (deductions made for delays).....	8 hr. 50 min.
Kw.-hr.	215
Average h.p.	25.9
Tons per hr.	9.73
Lb. per kw.-hr.	1,004

Michael Furlong, North Norwich

(Oct. 21-23.)

Silo Filling.

Size of Silo	14 ft. by 40 ft.
Quantity put in	154 tons
Total time (deductions made for delays).....	12 hr. 45 min.
Kw.-hr.	183
Average h.p.	21.5
Tons per hr.	7.5
Lb. per kw.-hr.	1,683

Chas. Fletcher, North Norwich

(Oct. 26.)

Silo Filling.

Size of Silo (not filled)	16 ft. by 37 ft.
Quantity put in	146 tons
Total time (deductions made for delays).....	7 hr. 15 min.
Kw.-hr.	129
Average h.p.	23.7
Tons per hr.	20.1
Lb. per kw.-hr.	2,262

Sawing Wood.

Buzz Saw	30 in. diam.
Speed	1,380 r.p.m.
Average power	10.3 h.p.

Barney Smith, South Norwich

(Oct. 31-Nov. 5.)

Silo Filling.

Size of Silo	14 ft. by 40 ft.
Quantity put in	154 tons
Total time (deductions made for delays).....	11 hr. 15 min.
Kw.-hr.	136
Average h.p.	16.2
Tons per hr.	12.7
Lb. per kw.-hr.	2,264



Demonstration of Silo Filling



Transformer and Motor Wagons employed for Silo Filling

The tables following give the data in detail, and also include a comparison on the costs of electric and steam drive.

The basis used for computing the cost of electricity was the cost to Toronto Township, \$2.00 per month service charge and \$36.00 per h.p. per year, assuming a load factor of 20 per cent., including threshing and silo filling. This works out to an average cost of 5c. per kw-hr., and this figure was used. The total hours actual running time assumed as 500 for the year, the average of 24 h.p. is taken for in the time noted with 2 electrical h.p.

The cost of separator for threshing, cutting box for silo filling and of labor, except attendance at the motor or engine, were ignored as they are the same for both steam and electric, comparison of the cost of power only being made.

Threshing Outfit

Electric, 25 h.p.		
Capital	\$1,200 00	
Life assumed as 20 years.		
Money borrowed for 15 years.		
Interest, 6 per cent.	72 00	
Depreciation (20 years), 3.36 per cent.	40 32	
Sinking Fund (15 years), 4.99 per cent.	59 88	
Maintenance, 2.5 per cent.	30 00	
Insurance on 75 per cent. valuation at 1½ per cent.	13 50	
Total Fixed Charges		\$215 90
Attendance for 500 hours, part of time	\$25 00	
Current by syndicate plan	206 60	
Haulage done by farmer—Ignored.		
Total Operating Costs		\$231 60
Total Fixed Charges and Operating Costs		\$447 50
Steam, 25 h.p.		
Capital	\$1,800 00	
Life assumed as 10 years.		
Money borrowed for 15 years.		
Interest, 6 per cent.	108 00	
Depreciation (10 years), 8.33 per cent.	149 44	
Sinking Fund (15 years), 4.99 per cent.	89 82	
Maintenance, 3 per cent.	54 00	
Insurance on 75 per cent. valuation at 1½ per cent.	20 25	
Total Fixed Charges		\$421 51
Attendance 500 hours, half time.	\$100 00	
Fuel and water furnished by farmer. Cost of fuel and hauling of water estimated (coal at \$4.50 per ton)	187 00	
Fuel by farmer for moving—Ignored.		
Total Operating Costs		\$287 00
Total Fixed Charges and Operating Costs		\$708 51

Table of Data Collected.
THRESHING.
Table No. 1.—Wheat.

Name of Farmer.	Township.	Date.	Condition of grain.	Time at place in days.	Time running—time of delays deducted.	Total in bush.	Total kw-hr.	Bush. per hour.	Bush. per kw-hr.	Kw-hr. per bush.	Average demand in h.p.		Electric cost.		Steam cost.		Savings per bush. by using electric drive.	Separator.	Notes.
											Tot.	Per bush.	Tot.	Per bush.	Tot.	Per bush.			
John Prouse	W. Oxford.	7/14 7/16 9/26 27-28	Good .	3	4H-16M	265	87	62.23.04	.32	27.2	4.35	.0164	6.77	.0256	\$.0092	Sawyer-Massey Peerless	Straw not cut		
Jas. Innes	"	10/1 part time	Good .	11	5H-5M	476	92.5	93.35.15	.194	24.3	4.63	.0099	7.20	.0154	.0055	McCloskey ..	Straw not cut		

Table No. 2.—Oats.

John Prouse	W. Oxford	7/16 7/17	Fair but tough	1 13	11H-15M	1,179	165	104.87.14	.140	19.6	8.25	.0070	12.84	.0109	.0039	Sawyer-Mas- sey Peerless	Strawnot cut	
Wm. Bownan, jr.	Dereham .	7/17 7/18	Wet and tough	1 13	8H-20M	1,190	141	143	7.50	.103	22.2	7.05	.0059	10.97	.0092	.0033	“	
J. D. Karn.....	W. Oxford	7/24 7/26	Fair..	1 13	7H-35M	1,450	198	191	7.80	.136	24.8	9.90	.0068	15.40	.0106	.0038	McCloskey.	Strawnot cut
Geo. Raymond ..	N. Oxford.	7/19 7/20	Fair..	2	6H-52M	1,140	203	162	5.36	.178	24.5	10.15	.0089	15.79	.0138	.0049	Geo. White & Sons,	Straw cut.
Jas. Innes	W. Oxford	7/27 7/28 10/1 part time	Good but tough	2 13	13H-35M	2,180	325.5	165	6.69	.150	24.4	16.28	.0074	25.32	.0117	.0043	McCloskey.	Strawnot cut

Table No. 3.—Hungarian Oats.

M. Furlong	N. Norwich	11/27	2	5H-45M	397	93.	69	4.27	.235	22.8	4.65	.0117	7.24	.0183	.0066	Straw not cut	
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SILO-FILLING.

Table No. 4.

Name of Farmer.	Township.	Date.	Size of Silo Ft.	Capacity in cu. ft.	Amount cut and elevated—tons.	Time at place—in hours.	Time running. Time of delays deducted.	Total Kw-hr.	Tons per hour.	Kw-hr. per ton.	Pounds per Kw-Hr.	Average demand H.P.	\$		\$		Saving per ton by using elec. drive.	Name of Cutting Box.	R.P.M.	Notes.
													Tot.	Per ton.	Tot.	Per ton.				
J. Fordon	N. Oxford.	7/21 7/23	14 x 40	6157.6	125 (*)	2	10H - 15M	197 12.4	1.57	1268	25.5	9.85	.0786	15.32	.1228	.0442	Blizzard No. 3.	944	Very green.	
J. J. Innes	“	10/1 2-3	16 x 45	9047.7	152½ (†)	2½	16H - 14M	275 9.51	1.75	1109	22.	13.75	.0902	21.40	.1410	.0498	C. Wilkin-son.	1000	Fair weather.	
J. Prouse	“	10/5 7/8	33 x 29 x 13½ oblig.	12917.5	270	2½	18H - 35M	367 14.5	1.36	1471	24.5	18.35	.0680	28.56	.1058	.0378	Blizzard No. 3.	944	Silo inside barn, trouble with belt.	
W. Bowman, Jr.	Dereham.	10/9 10	15 x 40	7068.4	175	3½	20H - 3M	336 8.75	1.92	1041	22.4	16.80	.0960	26.14	.1495	.0535	“	944	Rainy weather.	
S. J. Prouse ...	“	11-12 10/14 15-16	16 x 40	8042.4	189	2	20H - 15M	392 8.4	2.35	939	19.6	19.60	.1037	30.50	.1615	.0578	“	944		
J. Leigh	W. Oxford.	10/17 18	14 x 35	5388.	108	2	11H - 05M	215 9.73	1.90	1004	25.9	10.75	.0995	16.73	.1549	.0554	“	944		
M. Furlong.....	N. Norwich	Oct. 21-23	14 x 40	6157.6	154	2	12H - 45M	183 7.5	1.17	1683	21.5	9.15	.0593	14.24	.0925	.0332	“	944		
C. Fletcher ...	“	Oct. 26	16 x 37	7439.6	146	1	7H - 15M	129 20.1	1.13	2262	23.7	6.45	.0441	10.04	.0689	.0248	Wilkinson.	790	Rainy weather, Silo not filled.	
B. Smith	S. Norwich	Oct. 31 Nov. 5	14 x 40	6157.6	154	2	11H - 15M	136 12.7	1.13	2264	16.2	6.80	.0440	10.60	.0688	.0248	“	790	Another Silo partly filled.	

Weight of ensilage taken at 30 to 50 lbs. per cu. ft. according to condition.

Silos all round except in the one case above referred to as oblong.

(*) Filled 32 ft.

(+) Filled 37½ ft.

Demonstration Farms

In addition to the above work the Commission has in operation a number of farms completely equipped with electric power. In these places the recommendations of the Commission have been closely followed and very satisfactory results have been obtained. All these farmers have brought their own motors for operation in the house and barns, and have contracted with the Commission for 2 h.p. Following is a list of the names and locations of these farmers:—

Geo. Raymond,	Concession 3,	North Oxford
Alex. Anderson,	"	6, South Yarmouth
R. A. Penhale	}	" 9, North Yarmouth
B. E. Colhoun		
J. W. Innes	}	" 2, West Oxford
J. D. Karn		
K. C. Karn		

Mr. Raymond's farm was the first equipped, a 3-phase line being built 4/5 of a mile from the 2,200 volt line on Pemberton Street, Ingersoll, via the 13,200 volt poles and some poles which had to be set to this farm. For the purpose of getting complete records, a graphic recording watt meter, an excess demand time meter and watt-hr. meters have been installed.

The electrical equipment consists of

Lighting

House—19 lamps on 17 switches and two plugs for heaters.

Barn—20 lamps on 4 switches.

Hen-house—1 lamp on a switch.

Drive-shed—2 lamps on a switch.

Milk-house—1 lamp on a switch.

Lamps at the gate and on the flag-pole on a switch in the house.

On a corner of the drive-shed for lighting the farm yard, 1 lamp on a switch.

Heating

Toaster.

Electric smoothing iron.

Air heater.

Power

1 2-h.p., 25 cycle, 3-phase, 110-volt motor, mounted on a frame with handles.

The total connected load is 5,715 watts or 7.56 h.p. Most of the lamps are tungsten.

Switches have been installed at three locations for the motor:

No. 1.—In the barn where, when the motor is set, by changing the belts, the following pieces can be driven: a three-unit milking machine, plate grinder, cutting-box, fanning-mill, turnip-pulper, emery-wheel and grindstone.

No. 2.—On the end of the drive-shed for the drag-saw and the buzz-saw.

No. 3.—In the woodshed for the washing machine.

The motor is moved from place to place on a two-wheeled truck, and is shown in one of the cuts in this report.

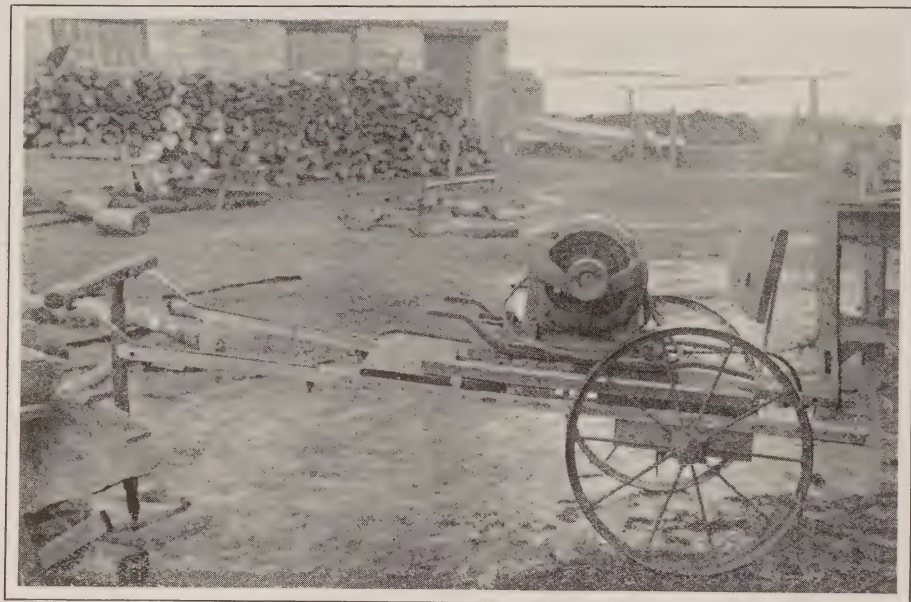
The following chart shows a typical load curve at Mr. Raymond's farm near Ingersoll, illustrating how 2 h.p. is used more or less steadily by Mr. Raymond during the day and the night.



Demonstration of Wood Sawing



Arrangement of 2-h.p. Motor at Mr. Raymond's Farm, Five Machines can be Driven
Without Moving Motor



Portable Motor, Mr. Raymond's Farm



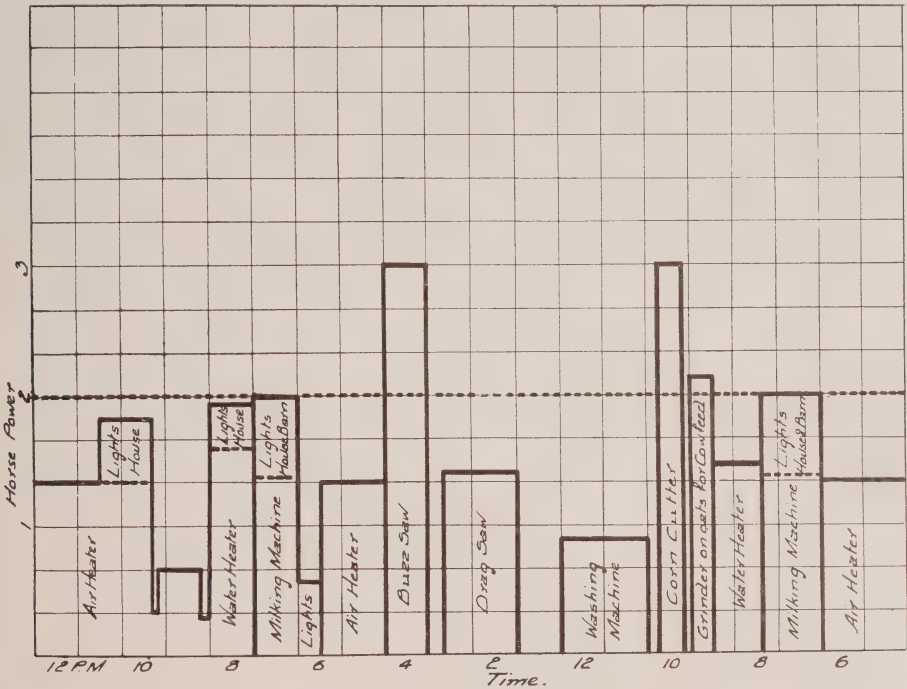
2-h.p. Motor, Belted to Drag-Saw at Mr. Raymond's Farm

From notes and charts it has been found that the following work can be done in the time noted with a 2 h.p.

Oats, ground fine enough for cow feed, about	10 bu. per hr.
Barley, fine enough for cow feed, about	6 bu. per hr.
Oats, fine enough for pig feed, about	3 bu. per hr.
Barley, fine enough for pig feed, about	2 bu. per hr.
Corn cutting, about 3 sheaves per min. when split in half.	
Turnip pulping, about	1¾ bu. per min.
Water heated with 1 h.p. (Container to be insulated to prevent radiation)	80 qt. in 8 hr.*

*This is computed from a test with 2,000 watts for 25 min.

This farm is equipped with nearly all of the machines and appliances recommended by the Commission, so that a great deal of data has been secured here.



Load Curve secured at Mr. Geo. Raymond's Farm

The following tables show approximately the quantity of power in watts and in h.p. taken by some of the lighting and heating apparatus, and the power taken by some of the farm machinery.

Lighting		Watts.	h.p.
Lamps, carbon	8 c.p.	30	.04
Lamps, carbon	16 c.p.	60	.08
Lamps, carbon	32 c.p.	120	.16
Lamps, metal filament	20 c.p.	25	.033
Lamps, metal filament	32 c.p.	40	.054
Lamps, metal filament	48 c.p.	60	.08
Lamps, metal filament	60 c.p.	80	.107
Heating			
Air Heaters	.....	250 to 6,000	.333 to 8.05
Broilers	.....	300 to 1,200	.4 to 1.61
Chafing Dishes	.....	200 to 500	.37 to .67
Cigar Lighters	.....	75	.1
Coffee Percolators	.....	100 to 440	.135 to .59

12 H.

Curling-Iron Heaters	60	.08
Fireless Cookers	100 to 440	.135 to .59
Flat-irons, 3 lb.	275	.37
Flat-irons, 4 lb.	350	.47
Flat-irons, 5 lb.	400	.53
Flat-irons, 6 lb.	475	.64
Foot Warmers	50 to 100	.067 to .53
Griddle Cake Cookers	300 to 1,000	.4 to 1.38
Heating Pads	50	.067
Immersion Heaters	110 to 440	.15 to .59
Nursery Milk Warmers	450	.65
Ovens	1,200 to 1,500	1.61 to 2.
Ranges	1,000 to 4,500	1.38 to 6.
Samovars	350 to 700	.47 to .93
Shaving Mugs	150	.2
Stoves, 3 in., 1 heat	100	.13
Stoves, 4-5 in., 3 heat	50 to 220	.067 to .29
Stoves, 6 in., 3 heat	100 to 440	.135 to .59
Toasters	330 to 1,000	.44 to 1.38
Water Heaters	400 to 800	.53 to 1.07

Power

Farm Appliances

		h.p.
Milking Machines	1/2	to 2
Water Pump	1/8	to 1
Grinders	2	to 5
Straw Cutters	2	to 5
Turnip Pulpers	1	to 5
Circular Saw	2	to 5
Ensilage Cutters	2	to 15
Washing Machines, small	3	to 10
Standard Washing Machines	14	to 25

Dairy Appliances

Cream Separators	1/6	to 1/4
Churns	1/6	to 1/4
Butter Workers	1/8	to 1/2

Domestic Appliances

Sewing Machines	1/12	
Vacuum Cleaners	1/12	
Washing Machines	1/6	
Fan	1/32	to 1/16
Hair Drier	1/2	to 7/8
Buffing, Grinding and Polishing	1/10	to 1

SUMMARY OF TEST ON ELECTRICALLY OPERATED FARM MACHINES. DATA PREPARED BY THE GENERAL ELECTRIC COMPANY.

Operation.	Capacity of Machine per H.P.	Size of Motor H.P.	Size of Motor * recommended.	Kilo-hour re- quired per unit.	Operating Cost, including interest, depreciation and labor, with cost of electricity, from 1c. to 10c. per kw.-hr. per unit.				†(Cost of Labor and Interest by per cent.	Depreciation and Power by per cent.
					1c.	3c.	5c.	8c.	10c.	
					Percent.	Percent.	Percent.	Percent.	Percent.	Percent.
Grinding Ear Corn	40 bushels.....	15	15	0.411	0.0236	0.0318	0.0400	0.0525	0.0606	30.0
“ Shelled Corn (fine).....	41.5.....	25	15	0.272	0.0139	0.0194	0.0248	0.0329	0.0384	51.0
Cracking Shelled Corn	65 bushels.....	25	10	0.086	0.0103	0.012	0.0137	0.0163	0.018	15.0
Shelling Corn (cylinder sheller) ..	114 “	25	10	0.0448	0.0119	0.0128	0.0137	0.0151	0.016	33.0
Rolling Oats (crushing)	111 “	25	10	0.062	0.0063	0.0075	0.0088	0.0106	0.0119	16.5
6-Roll Shredder and Husker	1.95 tons	15	15	5.37	2.6300	2.7400	2.8500	3.0100	4.1200	31.0
Cutting Fodder.....	2 “	10	15	2.08	0.3140	0.3550	0.3970	0.4590	0.5000	2.7
Root Cutter.....	5.78 “	2	2	0.158	0.1135	0.1166	0.1198	0.1245	0.1277	88.0
Threshing Barley	145 bushels	15	20	0.1257	0.0013	0.0038	0.0064	0.0100	0.0126	9.3
Separating Milk	1,300 lbs.....	1½	1½	0.0386	0.0269	0.0276	0.0284	0.0296	0.0304	18.6
Churning, Working and Washing Butter	100 gal. churn..	2	2	0.615	0.219	0.232	0.244	0.262	0.275	43.5
Grinding Sausage	750 lbs.....	4	2½	0.441	0.824	0.091	0.100	0.113	0.122	10.2
Sausage Stuffer.....	116 “	¾	¾	0.0525	0.3745	0.3756	0.3766	0.3782	0.3793	35.6
Washing Machine—capacity 12 sheets washful.....	3 sheets	½	½	0.0616	0.0429	0.0441	0.0454	0.0472	0.0485	20.0
Portable Vacuum Cleaner.....	1,000 square feet.	½	½	0.0226	0.0198	0.0203	0.0207	0.0214	0.0219	70.6
Large Vacuum Cleaner	1,640 “	3	3	0.107	0.091	0.093	0.095	0.098	0.100	18.2
Horse Groomer.....	7 horses	1	1	0.106	0.029	0.031	0.033	0.036	0.038	48.2
										6.3
										67.5
										75.0
										46.2
										88.0
										16.5
										6.8
										5.6
										0.7
										30.6
										51.6
										83.2
										6.8
										12.8
										22.0
										0.7

* This column shows the h.p. of a motor which is best adapted to a machine of this particular capacity.

† The interest and depreciation on the threshing machine as the machine was a custom machine, and it was impossible to secure the number of hours the machine was used during the year.

‡ The aggregate amount of work done in this case by the cleaner is too small to warrant such a large installation, because of the excessive depreciation and interest.

§ These percentages were figures from the actual tests, and are based on one year's operation of the machine on the farm where it was tested.

¶ If the farmer had selected the proper sized machine, many of the percentages in this column would have been materially reduced.

These tests were made on farms under actual operating conditions. The kilowatt hours required per unit of work will be approximately the same for either smaller or larger machines, providing they have been properly installed. Depreciation is figured at 10 per cent. and interest at 6 per cent. in all calculations.

Besides the saving in operating cost, the time saved in every case was quite large. Every farmer will appreciate this, as it will materially aid him in the solution of his labor problem.

LAMP, ILLUMINATION AND METER INVESTIGATIONS

Lamps

At the spring of the year the testing apparatus for lamps consisted of a specially designed rack capable of holding two hundred lamps. The current supplied for this came from the ordinary lighting mains, with no additional provision for the regulation of potential, owing to the fact that the quarters were temporary.

Samples of the various makes of lamps on the market were obtained, and their various initial ratings and their comparative performances determined. A certain percentage of these samples were photometered by Toronto University, and candle power curves calculated. The mechanical features were also carefully gone into, as the ruggedness of any type of metal filament lamp is of special importance to consumers.

From time to time reports were made, and on February 5th sufficient data was on hand to recommend the purchase of Laco lamps to satisfy the demands of the municipalities at that time. This make of lamp was recommended in preference to the various others tested by reason of its good mechanical construction, good life performance, and extremely low cost. Some of the other makes proved equal or even preferable in the first two items, but the low price asked by the Laco Co. altogether outweighed these considerations. This recommendation has been substantiated by further reports. Since February the advantage of low price held by the Laco lamp has lost considerable weight owing to the subsequent large reduction in prices of the Canadian-made lamps, and at present a large portion of the trade is divided with these manufacturers.

The following makes of tungsten lamps were submitted to test during the current year:—

Sunbeam Mazda.
Franklin Mazda.
Osram.
Laco.
"Z."
French Palo.
British Continental.
Siemens.
Fedram.
Monowatt.
Briton.
Graetzon.

G. E. Mazda.
Kolloid Wolfram.
Westinghouse.
Royal Ediswan.
Bergmann.
German Palo.
Dalite.
Nick.
Lion M.
Wixum.
Northern Light.
Electric Accessory Co.

The respective quality of the various makes of carbon lamps was also investigated, and resulted in the general recommendation of Canadian-made lamps. These were found to be closer to our specifications and to be possessed of better life characteristics than imported ones. The following types of carbon lamps were tested:—

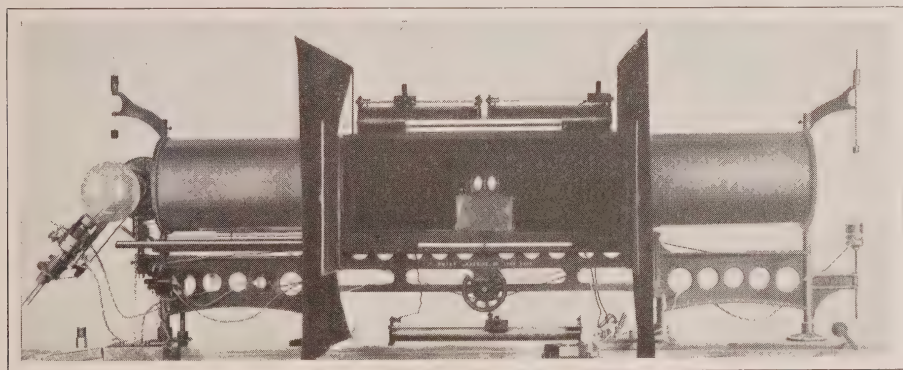
Sunbeam.
Brilliant.
Freidman.
R. Ediswan.
Chapman and Walker.
Federal.
Rex.
Siemens.

Canadian General Electric.
Bergmann.
Robertson.
Central Electric & School Supply.
Electric Product.
Premier.
Watt.

In June, a 100 inch laboratory photometer was installed at Strachan Avenue substation. This type was adopted on account of its suitability for rapid as well as accurate measurements, the former being important, taking into consideration the number of lamps which were being submitted for test and the prospective rapid increase in the quantity inspected. Other apparatus designed for testing the evenness of the filaments and the quality of the vacuum in the lamps was also installed, thus putting the lamp testing on an unquestionable basis.

A microscopic investigation was conducted on the relative quality of the drawn wire and pressed filaments, the object being to compare the deterioration of the two types from the factory product to the end of the average life of the tungsten lamp, approximately 1,000 hours. The test samples consisted of lamps representative of the two types and of equal rating. These lamps were burned on 25 cycle circuits, and a sample was examined at the end of each 200 hours of life.

Initially the pressed filament appears to be in a state of molecular strain, which can be attributed to the method pursued in its formation. Throughout its length the characteristic wavy structure is noticed as in visceous material under pressure. Small grooves transversely located seem to indicate line of weakness. Drawn wire



Photometer, Toronto Station

filament presents the appearance of having many longitudinal ridges, these ridges having an extremely small diameter. The strain condition, as noted in the pressed type, is absent. Generally speaking, the drawn wire filament appears to be and is mechanically stronger than the pressed filament, this condition being due to the process of manufacture by which the molecules are repeatedly worked and elongated, assuming positions conducive to tensile strength and ductility.

After short operation at normal working temperature, the drawn wire filament, however, loses practically all ductility and resembles superficially a pressed filament at the same period of its life. Numerous other interesting features were also noted during this investigation.

Summing up results, the following conclusions may be drawn in regard to the two types from the point of view of the consumer.

Initially, the drawn wire lamp presents the advantage of greater ruggedness, which is not only due to the ductile properties of its filaments, but also to the better mechanical construction which is rendered permissible in the lamp owing to this feature. This is a point which has a decided bearing on breakage in shipment and in handling the lamp before it is installed, and consequently is of considerable importance.

During life while the actual strength of the filament may deteriorate to that of a corresponding pressed filament, after a short period of burning; the mechanical construction being superior, the ruggedness of the drawn wire lamp is still superior to that of the pressed filament.

Again the manufacturing operations being simplified and reduced, there being one continuous filament instead of several independently manufactured, and two pinched joints instead of eight or more fused ones, the probable defects caused in manufacturing are correspondingly decreased and thus the percentage of lamps, which may be classified as defective when received by the consumer, should be reduced.

Performance curves of the available makes of both tungsten and carbon lamps were determined and by reason of the constantly improving qualities of the different makes, these comparative curves are now obtained periodically in order to substantiate recommendations.

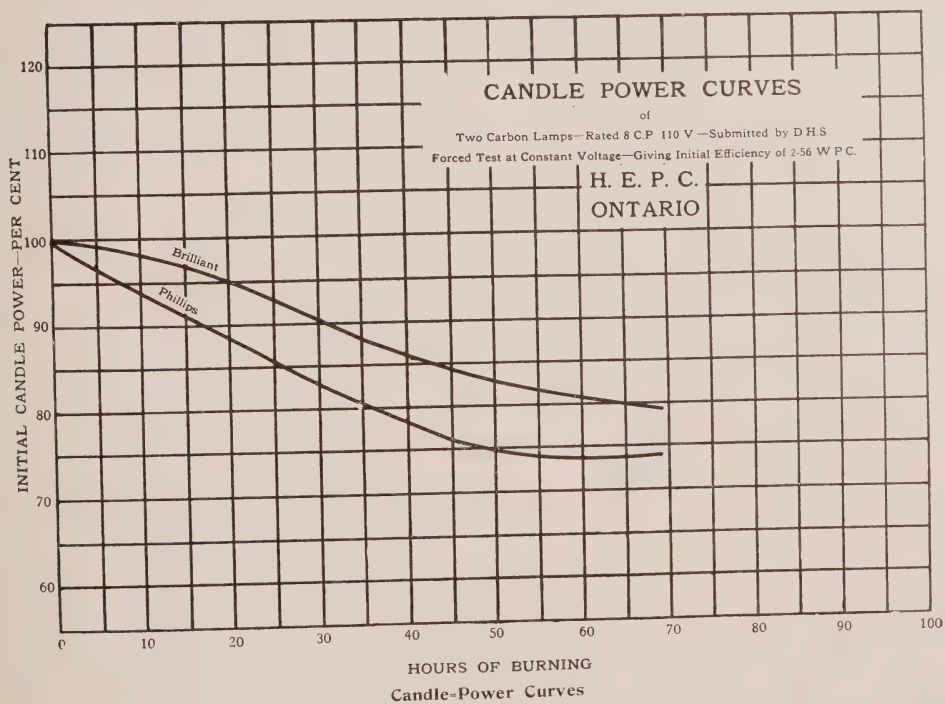
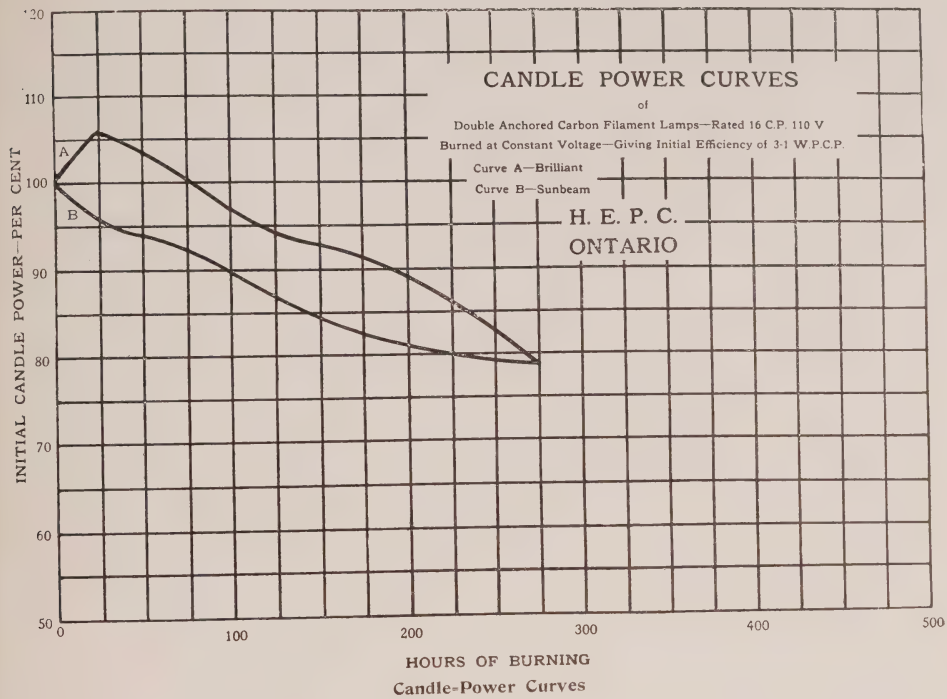
It might be advisable to explain on what basis recommendations are made when a certain type of lamp is specified for use throughout the Hydro-Electric System. The recommendation is not based on an opinion, but on an absolute calculation based on the data obtained from the photometric test of the lamps.

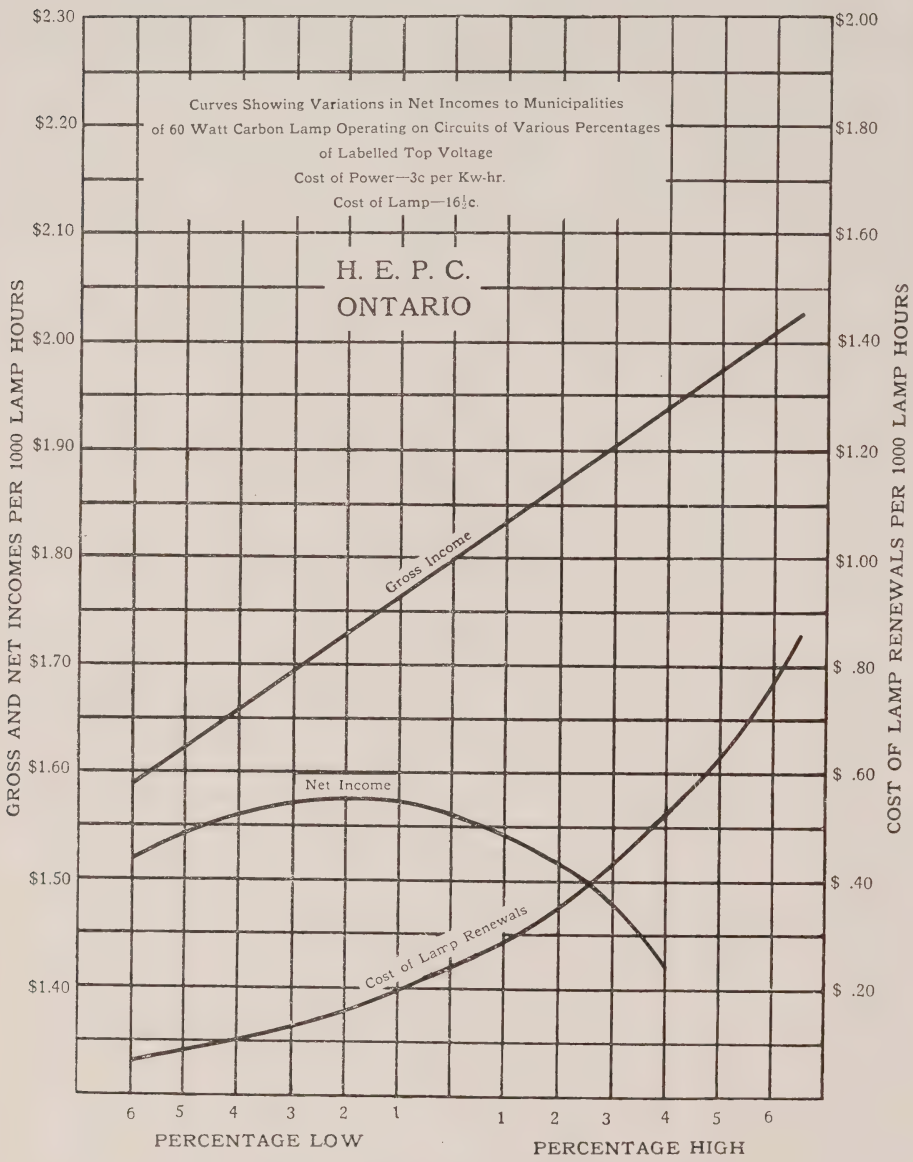
A lamp is required to produce illumination, this desired illumination being obtained by a certain candle power intensity in the lamp. From this it can be understood that which is paid for is hours of light, or to put it differently, candle hours. Therefore the light source showing a minimum total cost per candle hour under certain conditions is the one to be chosen for that type of installation. Factors governing this total cost of up-keep are,—the first cost of the lamp—its average candle power during life—the average watts consumed per candle power during life—its average life in hours to smashing point and finally the cost per kw-hr. for energy.

Having obtained the above necessary information on the different types of lamps on the market, the calculations are made and the type of lamp showing the lowest cost per candle hour is the one which is recommended for use.

Calculations were also made and curves obtained illustrating the correct efficiency at which a certain type of lamp should be burned in order to obtain a minimum cost per candle hour for that type. This efficiency varies with the price of power, the cost of renewals and the life of the lamp and with the low rates of power prevailing on the Hydro-Electric system is a matter which should be determined and the information utilized.

Specifications for lamps purchased were drafted after a study had been made of those issued by the American Bureau of Standards and of others issued by various private corporations. These specifications were forwarded to the companies supplying lamps to the Commission. In connection with this it might be noted that owing to lack of photometric equipment at the Dominion Laboratory, Ottawa, any question raised by the manufacturer as to measurements, would necessarily have to be referred to the American Bureau of Standards for verification.



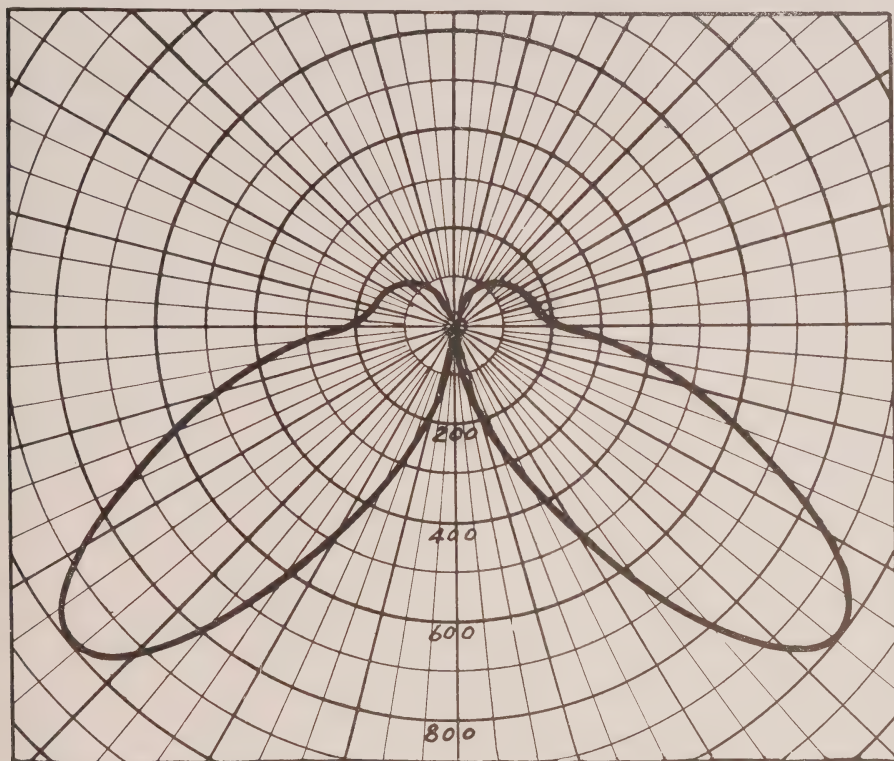


Curve Showing Variations in Net Incomes to Municipalities

Illumination

Data was obtained on the efficiency and distribution of various reflectors on the market especially those adapted for street lighting. The distribution obtained from a light source is of prime importance in street lighting and one where there is considerable room for improvement. The attached diagrams show some typical distributions obtained from different light sources.

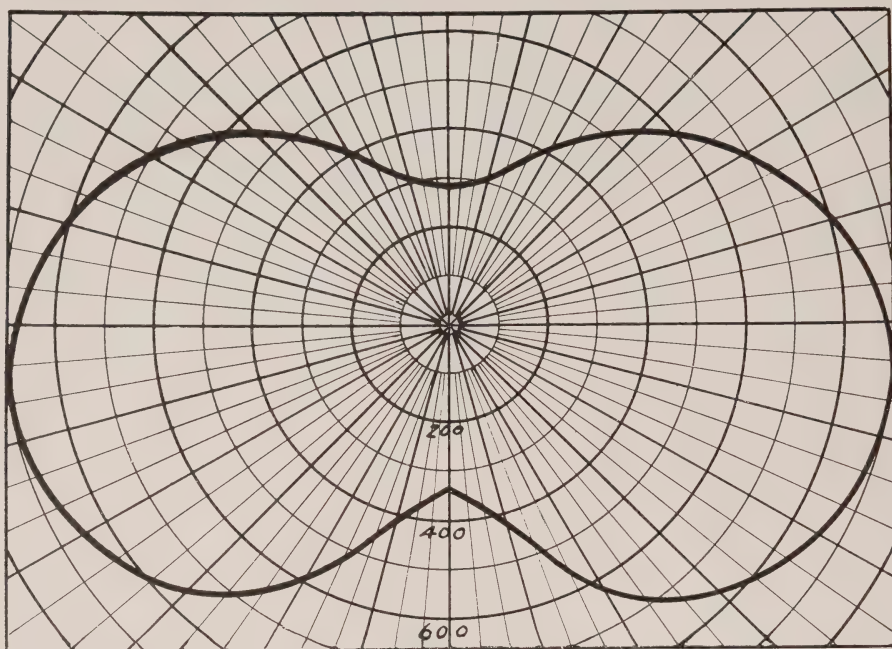
The importance of choosing a type of glassware having a maximum diffusion with minimum absorption cannot be too strongly brought to notice. The accompanying illustrations show the wide variation in efficiency of the different types.



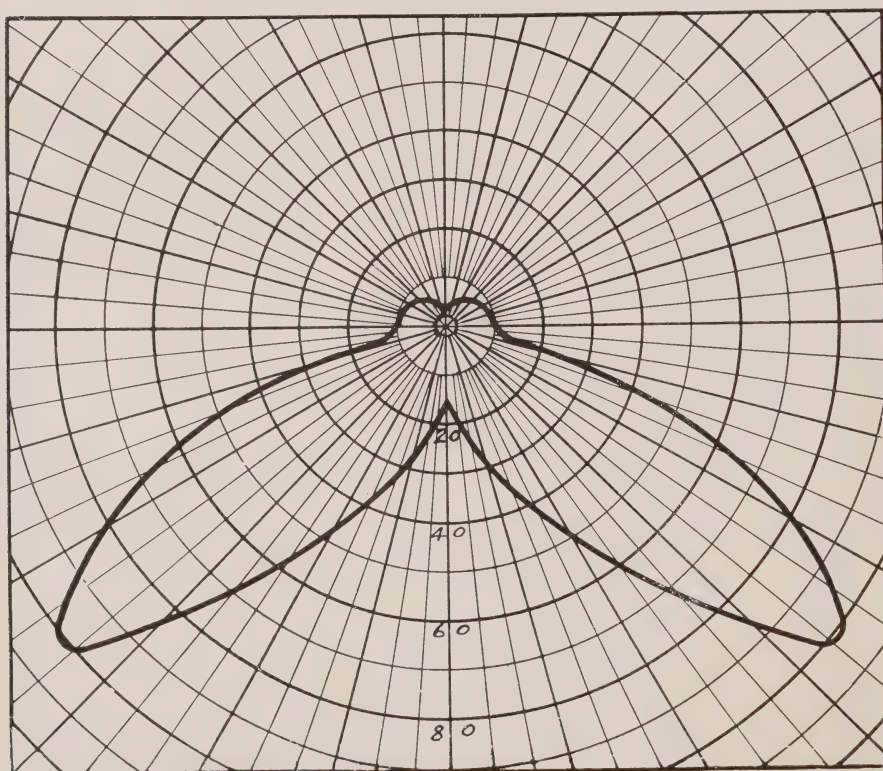
Curve Showing Distribution from 500 Watt Enclosed Arc Lamp

Another feature brought to notice is the necessity of cleaning frequently the glassware used in street lighting. The absorption by dirt amounts to a considerable percentage of the total flux generated after a very few weeks' use.

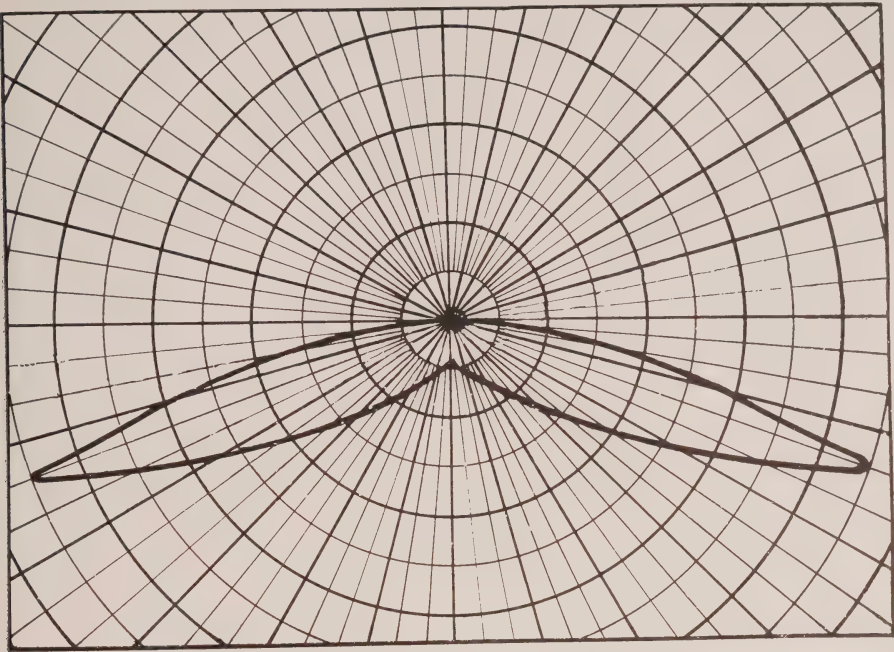
A Sharp—Millar Illumination photometer was purchased in June, and during the months of July, August and September investigations were made into the types of street lighting systems in use by the municipalities in the Hydro-Electric system. The general idea of these investigations was to obtain measurements of the resultant illumination derived from the different systems, photos giving the physical appearance, and such other details that would prove of use in the laying out or in the advising of future installations.



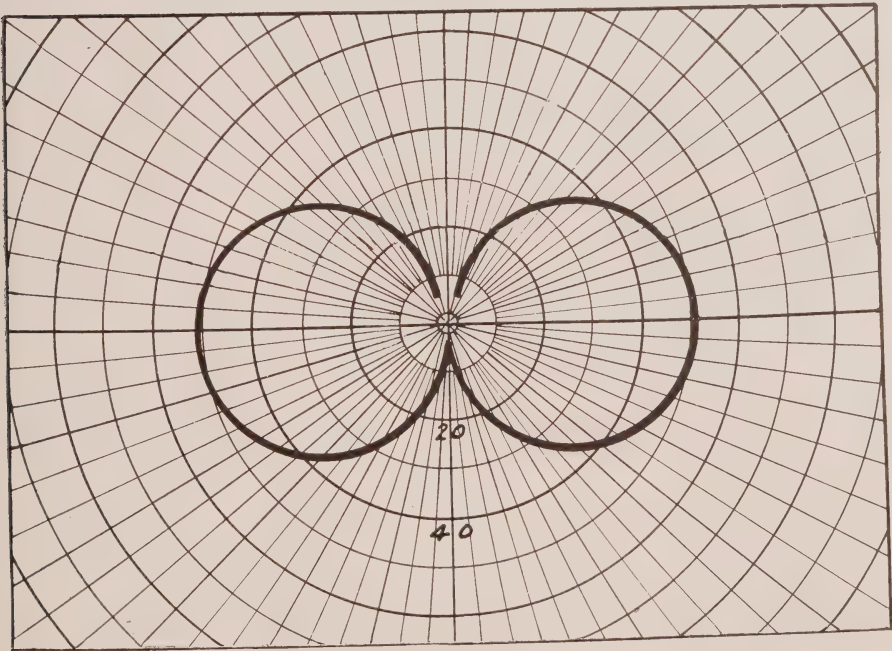
Curve Showing Distribution from 500 Watt Luminous Arc Lamp



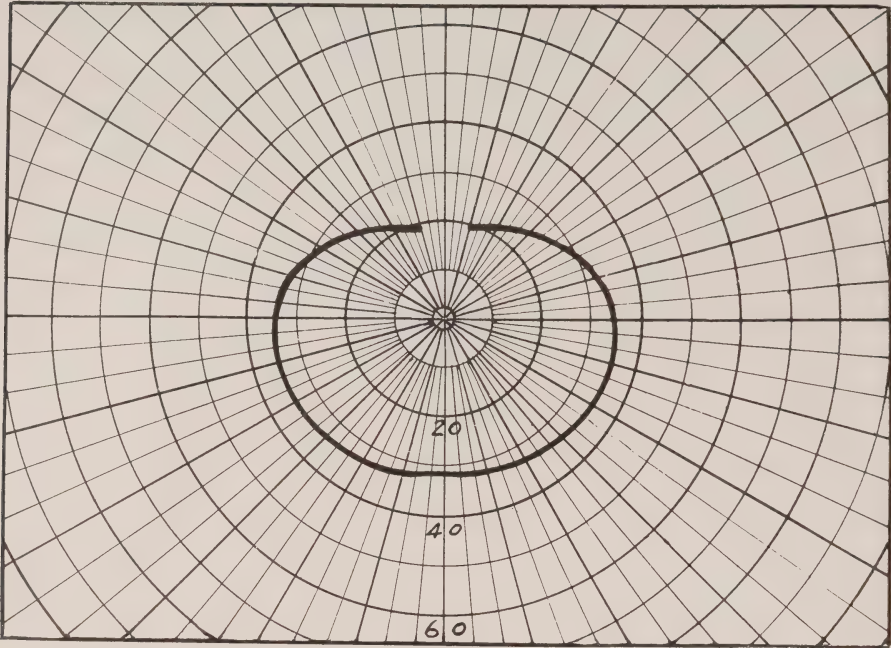
Curve Showing Distribution from 90 Watt Lamp, Equipped with Holoplane Street Lighting Reflector



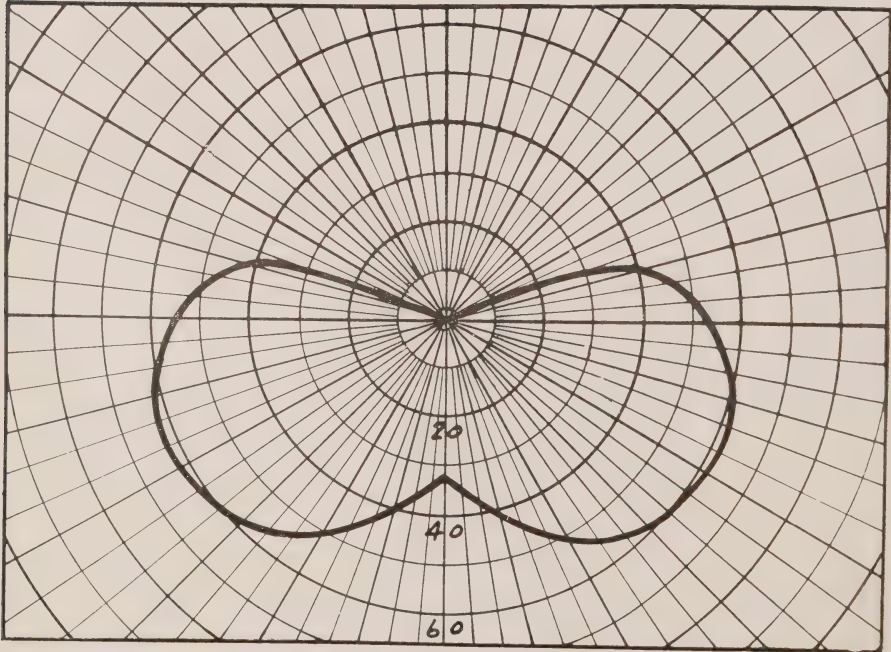
Curve Showing Theoretical Distribution for Equal Horizontal Illumination ($\frac{\text{Space}}{\text{Height}} = \frac{6}{1}$)



Curve Showing Distribution from 90 Watt 110 Volt Clear Tungsten Lamp



Curve Showing Distribution from 60 Watt Lamp, Equipped with 12-in. Diffusing Globe.



Curve Showing Distribution from 60 Watt Lamp, Equipped with Radial Wave Reflector.

Accompanying illustrations give data on some of the typical installations. These are:—

Richmond Street, Toronto

5 lamp clusters, lamp surrounded by diffusing globes.

Jarvis Street, Toronto

Lantern type fixtures, single lamp surrounded by diffusing 8 in. cylinder.

Victoria Avenue, Hamilton

Enclosed arc system.

Cameron Street Galt

Series tungsten Wheeler reflector.

This collected information is shown in approximately a standardized form in order to simplify comparisons of the different systems. The method of showing the resultant illumination by means of isolux areas has probably not, been attempted before. The idea has been but roughly carried out, but even as it is, has the great advantage of presenting pictorially the approximate conditions of the illumination on the street, which, when stated in foot candles intensities, are not conveyed to the average reader. On account of the wide divergence in the maximum and minimum illumination each area is forced to include a considerable range in the intensity of illumination. Actual foot candle intensities, however, can be obtained at any point from the illumination curves.

A noticeable feature in the many ornamental systems encountered is the lack of originality in the choice of standards. A 5-lamp cluster of classic design has been adopted in nearly every case, and in many places is totally unsuited to its surroundings. In the smaller towns a single lamp standard of less imposing design should be recommended and adopted. Glare, though diminished by the adoption of diffusing globes is considerably in evidence. A night photograph of an installation shows fairly clearly by the spread of halation around the light sources on the negative, conditions that the eye has to contend with in looking down the street. These points have been discussed with the local Commissions and recommendations made, to increase the height of the light sources on the standards and restricts, if possible, by means of reflectors the flux of light from each source to a certain area apportioned to that unit. The evenness of the illumination derived from these ornamental systems still leaves considerable to be desired. The ratio of maximum to minimum illumination averages 20 to 1, a variation so wide and occurring at such close intervals along the street, as to promote eye-strain.

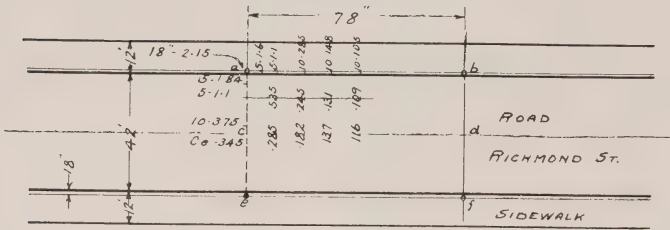
Summing up the features of the various installations examined, the following improvements are suggested:—

Increased Evenness of Illumination

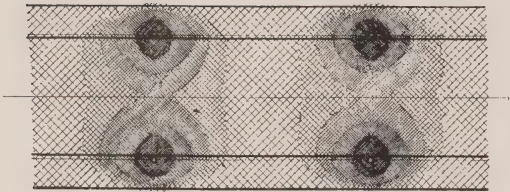
This may be accomplished: 1. Decreasing the ratio of spacing to height of light sources, and thus the ratio of maximum to minimum illumination. The present ratio of spacing in Toronto, for example, is approximately 9-1. A ratio of 6 to 1 is not difficult to attain and this may be realized preferably, by

STREET LIGHTING DIAGRAM

PLAN OF ILLUMINATION MEASUREMENT.



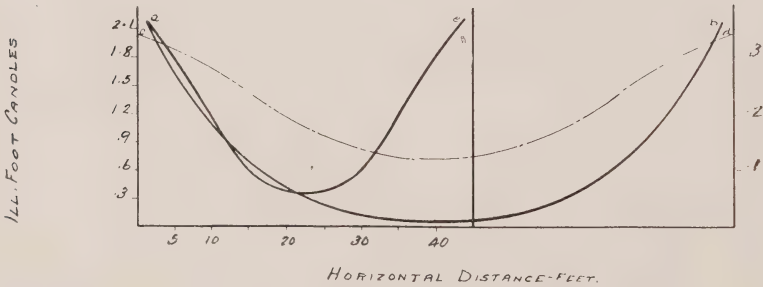
ISOLUX AREAS



Ft. Cols.

1.28 - 2.56	
.64 - 1.28	
.32 - .64	
.16 - .32	
.08 - .16	

ILLUMINATION CURVES.



MAX ILL. 2.15 FT. CANDLES MIN STREET ILL. 1.09 FT. CANDLES AVER. ST. ILL. (CENTRE) 2.13 FT. CANDLES.

WATTS PER LINEAR FT. 12.5 WATTS WATTS PER SQ. FT. 3 WATTS

TYPE OF LIGHT SOURCE - SLAMP CLUSTER TOTAL WATTAGE 500 APPROX. MHCP 420 APPROX. LUMENS 4200

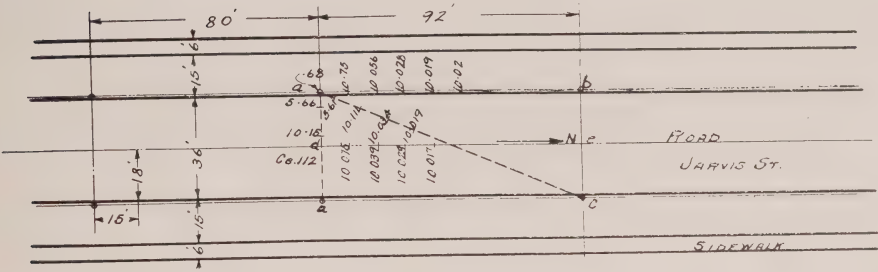
DIFFUSING APPARATUS - HASKINS & ROUGHED INSIDE HEIGHT OF LAMPS - 9' 6" TO PENDANT 11' 6" TO UPRIGHT.

SPACING OF STDS. - 78' HEIGHT OF PLANE OF MEASUREMENT

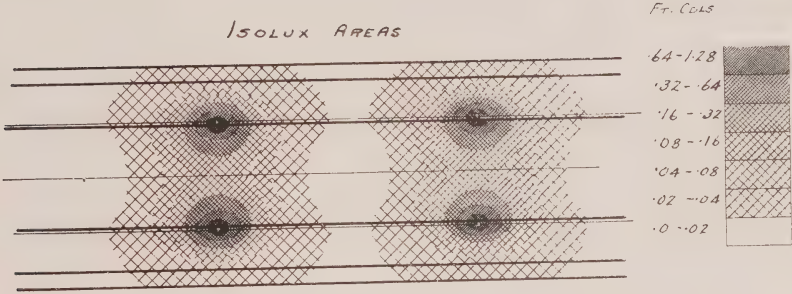
Richmond St., Toronto

STREET LIGHTING DIAGRAM

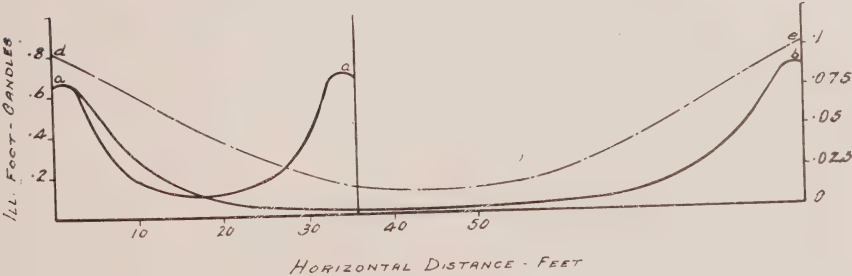
PLAN OF ILLUMINATION MEASUREMENTS



ISOLUX AREAS



ILLUMINATION CURVES

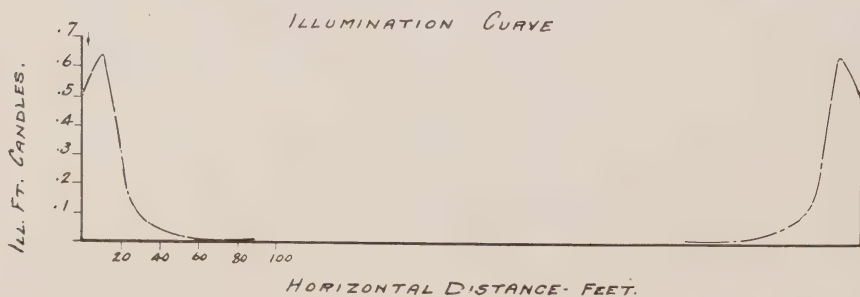
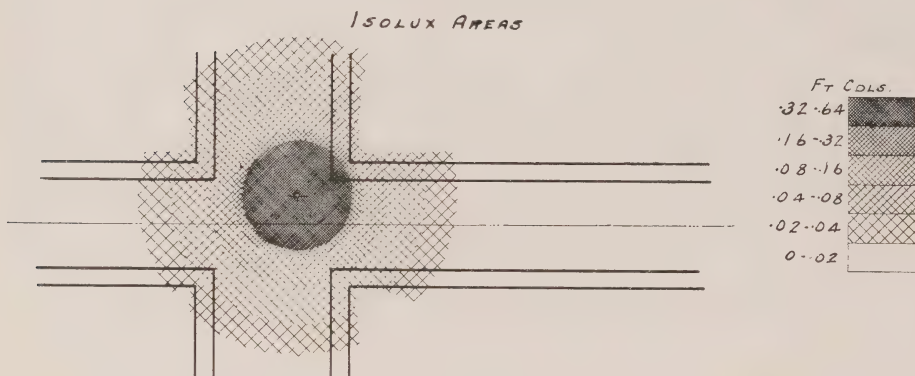
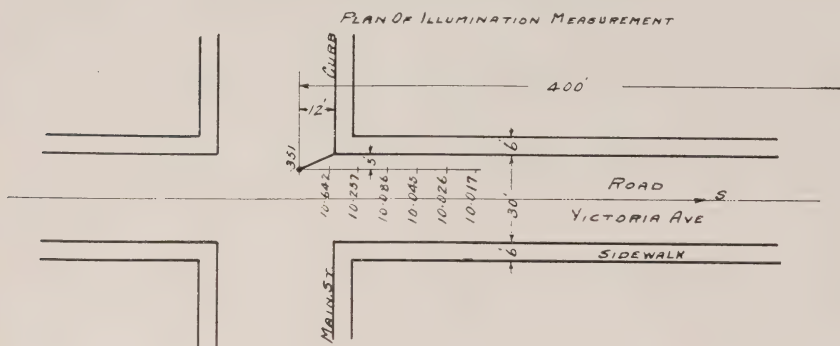


MAX. ILL. 0.7 FT CANDLES MIN STREET ILL. 0.01 FT CANDLES AVER. ST ILL (CENTRE) 0.038 FT CANDLES
WATTS PER LINEAR FT 2.22 WATTS. WATTS PER SQ. FT 0.124 WATTS.

TYPE OF LIGHT SOURCE - TUNGSTEN LAMP TOTAL WATTAGE 100. APPROX. TOTAL M.H.C.P. 80. APPROX. LUMENS 800
DIFFUSING APPARATUS - LANTERN TYPE (DIFFUSING CYLINDER) HEIGHT OF LAMP 9'-6"
SPACING OF STDS 90' (APPROX) HEIGHT OF PLANE OF MEASUREMENT 30"

Jarvis St., Toronto

STREET LIGHTING DIAGRAM



MAX. ILL. - .65 FT CANDLES MIN. STREET ILL. - FT CANDLES AVER. ST. ILL (CENTRE) - FT CANDLES

WATTS PER LINEAR FT. - 125 WATTS WATTS PER SQ. FT. - 0.41 WATTS.

TYPE OF LIGHT SOURCE - ENCLOSED ARC. TOTAL WATTAGE - 500 APPROX. M.H.C.P. - 2000 (MAX) APPROX. LUMENS -

DIFFUSING APPARATUS - OPAL GLOBE

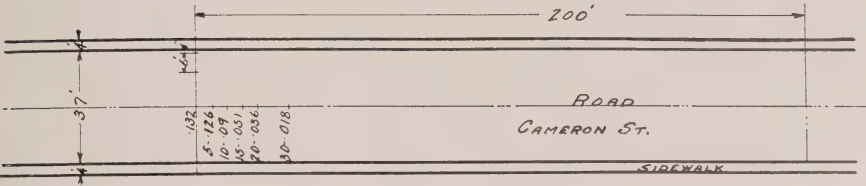
HEIGHT OF LAMP - 30'

SPACING OF STDS. - 400' (APPROX) HEIGHT OF PLANE OF MEASUREMENT - 30"

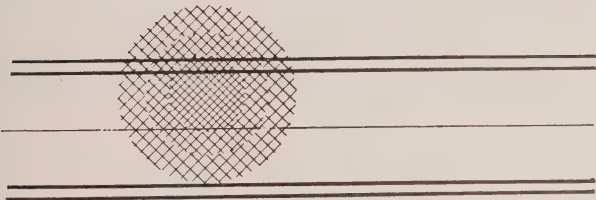
Victoria Ave., Hamilton

STREET LIGHTING DIAGRAM

PLAN OF ILLUMINATION MEASUREMENTS



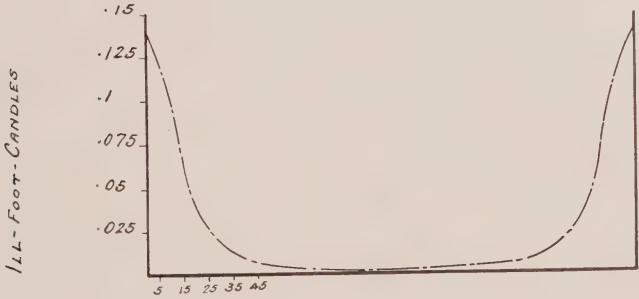
ISOLUX AREAS



Ft. Cds.

.08-.16	
.04-.08	
.02-.04	
0-.02	

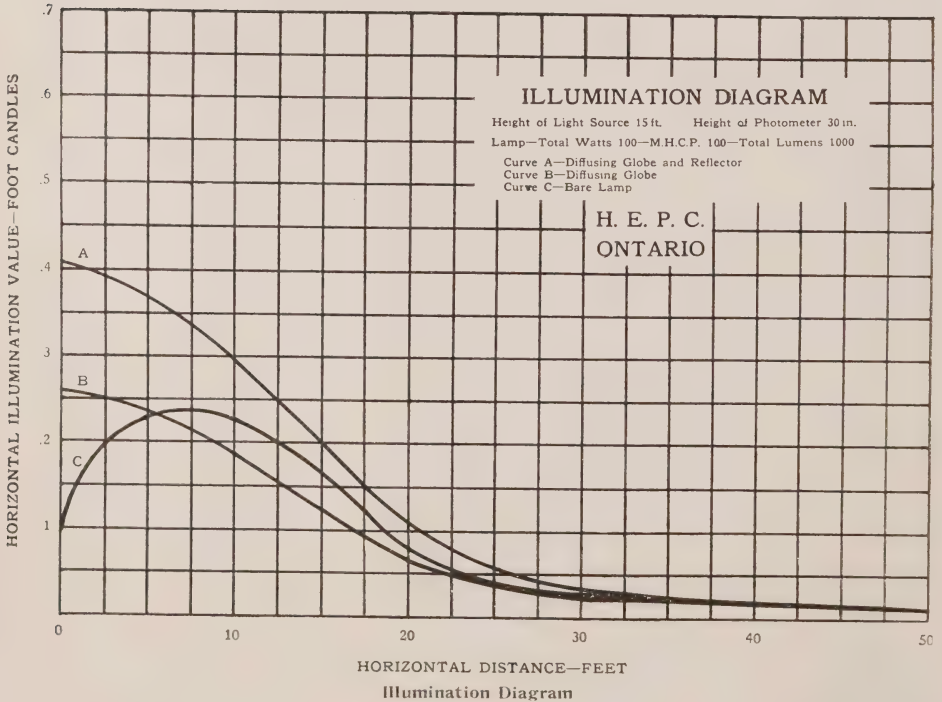
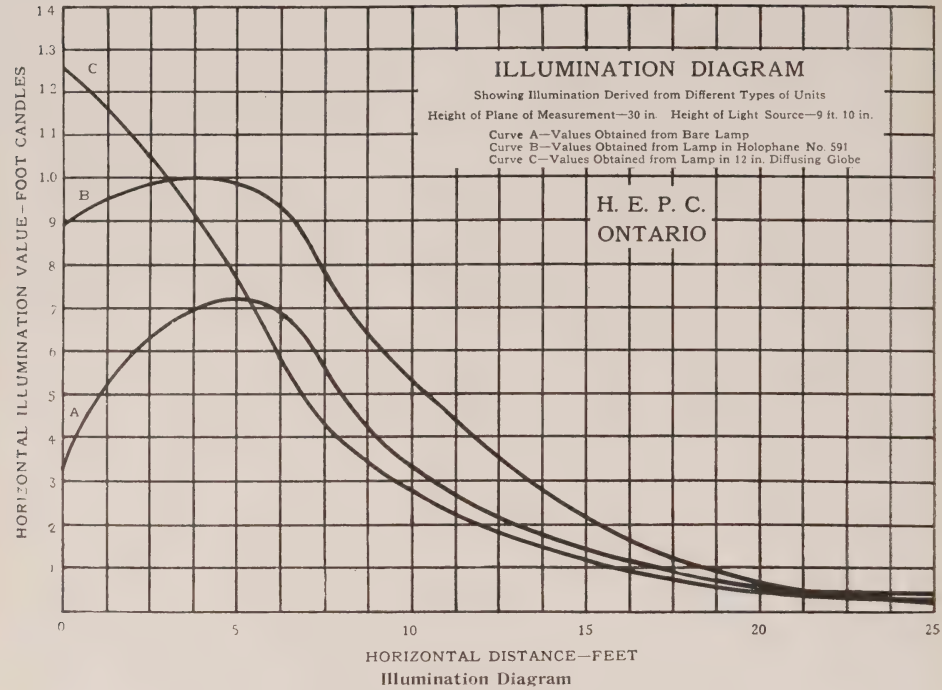
ILLUMINATION CURVES

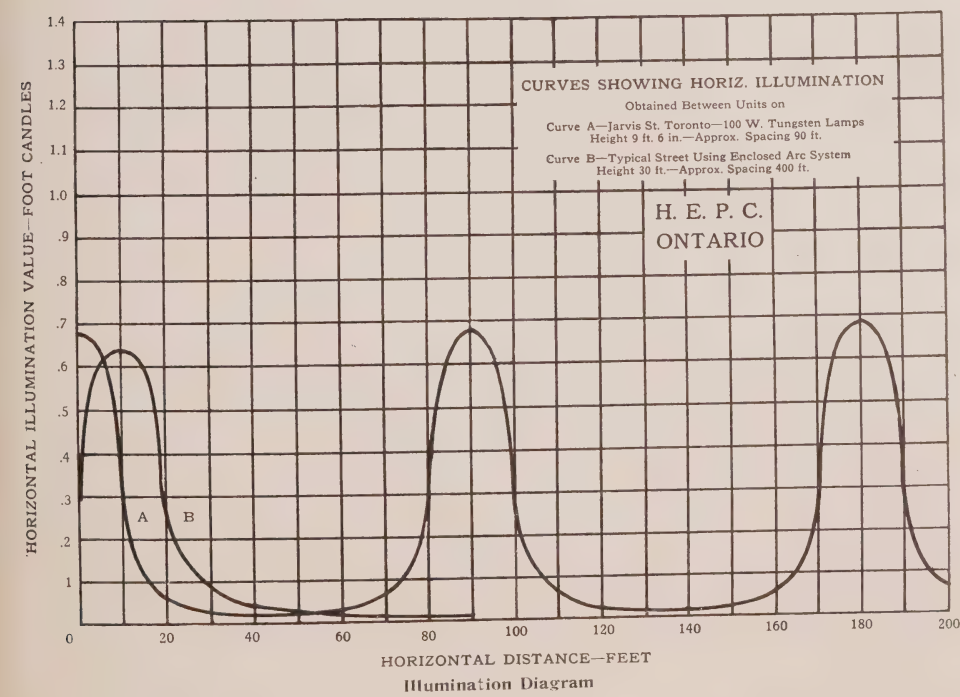
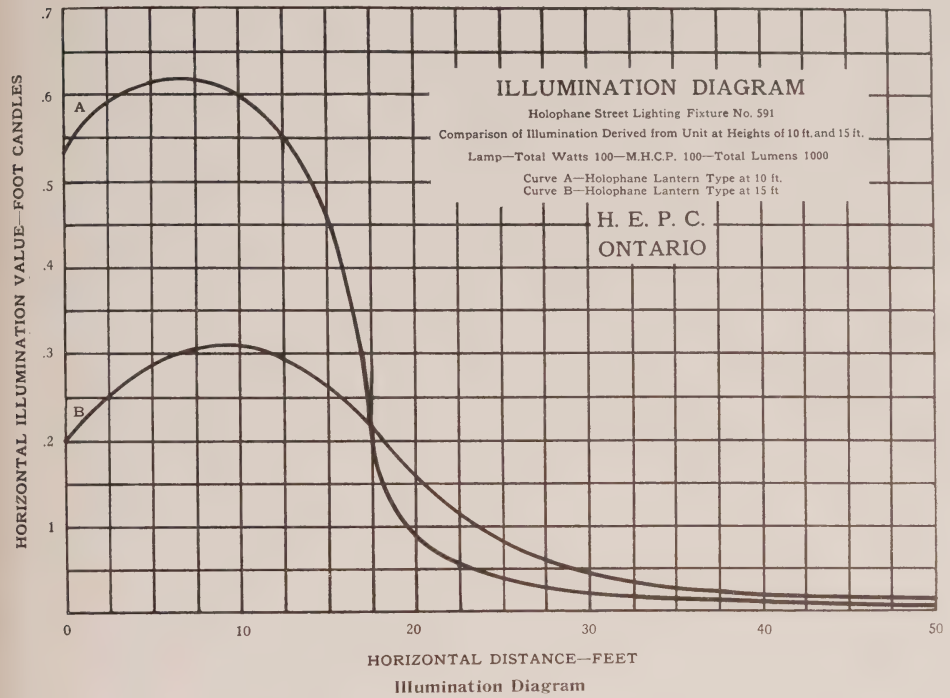


HORIZONTAL DISTANCE- FEET

MAX. ILL.- .132 FT. CANDLES MIN. ST. ILL.- .009 (CALC) AVER. ST. ILL (CENTRE)- FT. CANDLES
WATTS PER LINEAR FT.- .5 WATTS WATTS PER SQ. FT.- .014 WATTS
TYPE OF LIGHT SOURCE- SERIES TUNGSTEN TOTAL WATTAGE- 100 APPROX M.H.C.P.- 80
APPROX LUMENS- 800
DIFFUSING APPARATUS- 18" WHEELER REFLECTOR HEIGHT OF LAMP- 16'
SPACING OF STDS.- 200' HEIGHT OF PLANE OF MEASUREMENT- 30"

Cameron St., Ga t





increasing the height of the units rather than by decreasing the spacing. In connection with this, the practice of staggering the standards on each side of the street is usually to be recommended and accomplishes, to a certain extent, the above recommendation without increasing the number of standards or the height of same.

2. By improving the distribution of the light intensities from the sources. The distribution of an incandescent lamp is extremely inefficient for street lighting, the upper hemispherical flux being a large portion of the total and being of little use, and the lower hemispherical flux giving an intensive rather than an extensive candle power curve. This extensive distribution can only be attained by the use



Brampton Standard Lamp Bracket

of efficient reflectors or by the adoption of light sources other than incandescent lamps, giving a more ideal distribution for this work.

Second Class Street Lighting

The usual system encountered is that of using 80 or 100 c.p. series lamps placed 15 to 16 ft. above street, 200 ft. spacing, sometimes more. A considerable improvement could be effected by the adoption of say 250 watt lamps at even wider spacing thus taking advantage of the silhouette effect, being that obtained when an object is interposed between an observer and a bright background. With the 80 c.p. lamp the illumination is too low on the area surrounding the pole to make this feature available.



Single Globe Park Standard



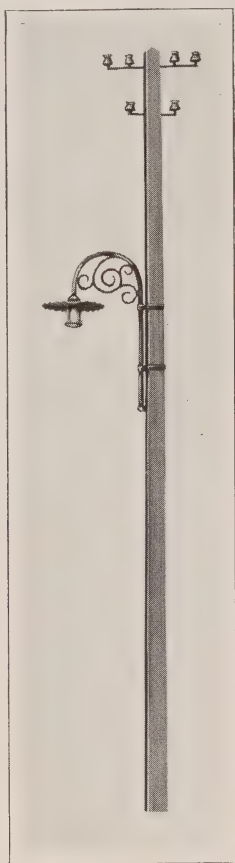
Standard Single Lamp Bracket

Corner Lighting

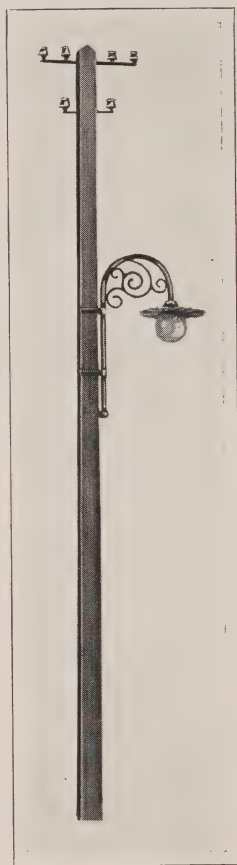
The illumination at all street intersections should be considerably increased over the average illumination between corners, the reason being obvious. This feature has been largely adopted in Woodstock and will become a part of the Hamilton Street Lighting System.

Glare

This physical phenomena is unfortunately present in all installations consisting of low hung light sources of high intensity or surface brightness. If the units



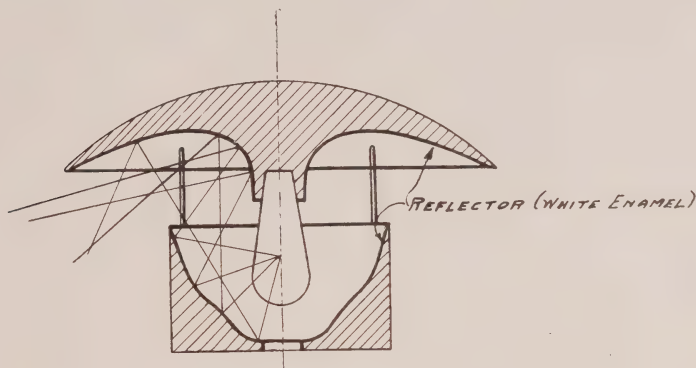
Street Lighting Bracket



Street Lighting Bracket

lie directly in the line of vision or at a small angle therefrom (approximately 20 to 25 deg.) the normal acuity of vision at that illumination is considerably decreased. The remedy lies in decreasing the surface brightness of the source of light by surrounding it with a globe of diffusing glass which accomplishes the desired effect, though at considerable absorption, or else by removing these units from the direct line of vision, which may be accomplished by restricting the flux of light to a certain area surrounding each source, and thus limiting the angle of incidence at which light from the same enters the eye.

In connection with the elimination of glare and the improvement of distribution of light intensities from a unit, the indirect street lighting fixture, which is supposedly being developed by some of the manufacturing companies at our suggestion, should accomplish a very great deal. By means of the two reflectors theoretically the flux of light can be restricted to the desired area and the distribution curve from the same may be such as to result in even illumination with a



Suggested Type of Fixture for Indirect Street Lighting

given ratio of spacing to height on which to calculate the same. Whether a reflecting surface of some cheap material such as porcelain enamel can be utilized which will produce the desired curve, and whether the absorption by the double reflection of a considerable portion of the flux will not prove too large, is a question which has not been settled.

Meters

The choice of the most suitable type of watt-hour meter being a question of prime importance to the municipalities, investigations were started along this line early in the year. Several Canadian factories were visited and the methods of construction and calibration were noted. A meter testing board was set up at Strachan Ave., with the necessary apparatus for producing a varying load, potential and power factor, as well as specially designed instruments for measuring the torque and friction of the moving element. Samples of eight different makes of watt-hour meters were obtained and a series of tests performed.

As regards the recommendation to the municipalities of a certain type of meter, the following points must be considered. If the power charges were based solely on current consumption as shown by meter, the most accurate and best constructed meter irrespective of cost would probably be ultimately the most economical. As, however, the charges throughout the system are determined by adding current charges, as ascertained by the meter, to a fixed area charge having no relation to the current consumed, it is conceivable that the economy from a highly accurate, as compared to a less accurate and less expensive meter, would not by the increased revenue from more accurate meter reading off set the greater interest charge on the larger capital invested in the meter.

In order to decide between high priced, highly accurate meters and suitable cheaper and less accurate meters, which in some cases may show meter readings a good deal less than the volume of current actually passed through the meter, not only are a series of careful tests with the different types of meters available, essential, but also a knowledge of the performance of a large number of such meters on actual service runs during considerable periods. The data which is required to figure out comparative results will include:—

1. The Losses in Metering.

- (a) Loss in watts in potential coil multiplied by hours per annum.
- (b) Average loss due to inaccuracy of registration at average load multiplied by working hours per annum. This could only be determined by service runs, and would be governed by the frequency of inspection and recalibration.

2. Charges for Renewals.

Ascertained from data obtained from meters in actual service.

3. Percentage of Prime Cost to be written off annually for Depreciation.

This percentage can be ascertained only by experience. It would be well to under estimate rather than over estimate the number of years useful service to be got out of each type of meter.

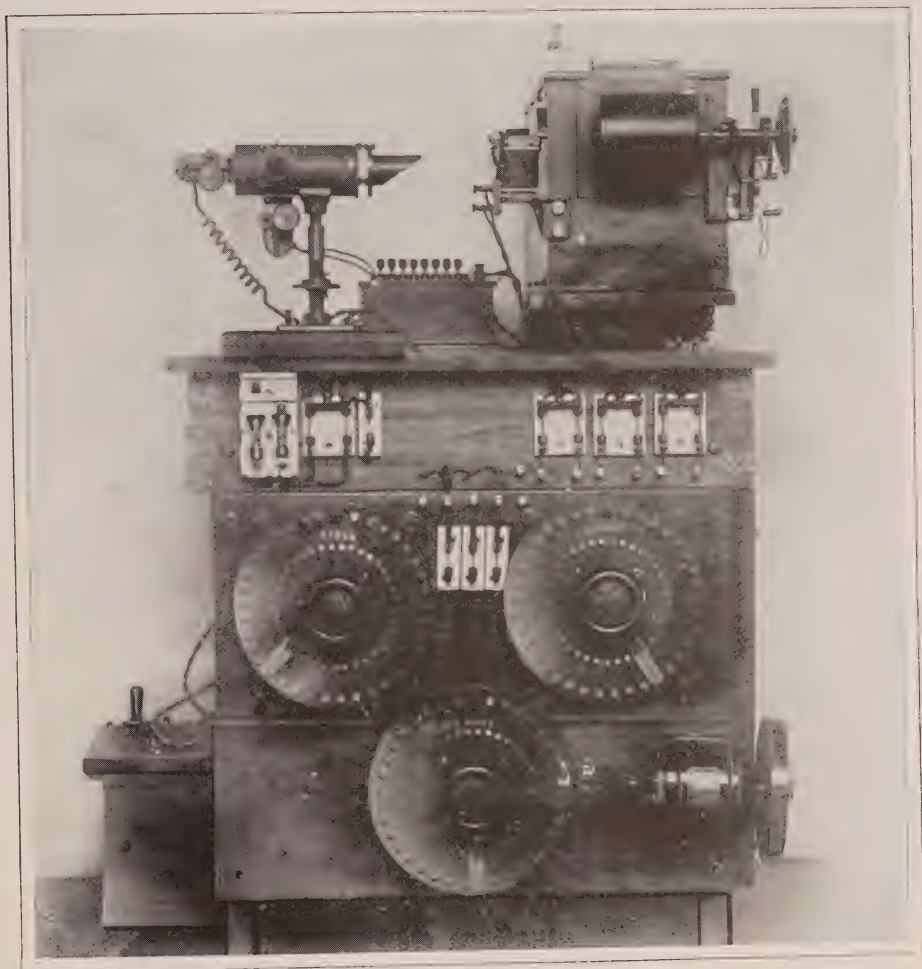
4. Annual Interest on Prime Cost.

Estimated 4 per cent.

If the various house service meters in use in the Hydro-Electric system were periodically tested and recalibrated and results available to the Commission, this data necessary to calculate the cost per type of meter per annum could be readily obtained. This is not the case, however, and as it would not be practicable to approximate values as a result of tests on a few meters only, the recommendations must necessarily cover the several types which in our opinion most nearly satisfy the desired conditions.

Investigations were also made on time switches, current limiters for use with flat rate customers, two rate meters, excess demand indicators, subtraction meters and other special metering devices.

Various indicating meters and primary standards have been added to the stock of instruments, and when the laboratory is available, all facilities for maintaining its secondary standards in first class calibration will be had. The indicating instruments which have been used by meter inspectors and also by the district engineers have been maintained in good condition and recalibrated periodically.



Oscillograph, Toronto Station

The oscillograph has proved valuable on several occasions and has been used in different parts of the system in connection with the investigations on electrolytic lightning arresters. A special table which may be taken to pieces and a box to contain it with the additional apparatus necessary, has been designed and constructed for the oscillograph and has proved of great value.

In connection with the work for the coming year, the Lamp Department will be able to extend considerably its usefulness. The storing and handling of all the lamps supplied to the municipalities gives a controlling hand over the manu-

facturers, insuring good and consistent quality, and also makes the delivery of lamps a quicker and much simpler operation. Tests and reports on the quality and performance of lamps will be also based on the performance of a large number rather than of a few samples, and much valuable information so obtained. The additional cost of storing, testing and handling lamps should not exceed 1 per cent. of the cost of same, based on the present shipment, and as the quantity of the shipments increase this percentage should diminish. Taking into consideration that the Commission will do the storing, a further reduction should be made by manufacturers, and so it is possible that no addition need be made in cost of lamps to the municipalities.

The photometric work will be allowed a much wider scope with the improved means the laboratory will give. The maintenance of secondary meter standards, the recalibration of working standards, the repair of graphic meters, etc., as well as the development of important and special types of meters will all be carried on in the laboratory, under favorable conditions.

The testing of transformer oil, insulators, etc., will also be taken over from the Dundas station.

CHAPTER V

HYDRAULIC INVESTIGATIONS

SUMMARY

County of Huron

Under date of December 5th, 1910, the Goderich Board of Trade made application to the Hydro-Electric Power Commission for a report as to the quantity of power capable of development on the Maitland River, with estimates of cost. The Board was informed that the Commission could not act in the matter except upon authority of a formal resolution from the Town Council. Under date February 2nd, 1911, the Chairman of the Commission, in response to a letter from the Clerk of the Municipality, again mentioned the necessity of obtaining a formal resolution of the Town Council setting forth the points upon which information was required. On February 27th, 1911, the Clerk of the Municipality forwarded the required resolution, asking for a detailed report as to the possibilities of power development on the Maitland River and also estimate covering the cost of power delivered from the Niagara System, by means of an extension of the Stratford-Seaforth line. Under date of March 1st, 1911, the Clerk was informed that the matter had been turned over to the Commission's Engineers for investigation and report.

Owing to the large amount of work already in the hands of the Commission's engineers, there was no opportunity to give the matter serious consideration until the last week in April, 1911, when two of the Commission's engineers visited Goderich for the purpose of estimating the market possibilities, and to make a preliminary investigation of the various power sites upon the Maitland River in the vicinity of the Town.

Previous to this visit to Goderich, the point came up during discussion as to whether or not it would be economically feasible to develop the higher stages of flow in the Maitland River and furnish auxiliary power to the Niagara System through an extension to the Stratford-Seaforth line. In the meantime, also, the various municipalities in the County of Huron had become interested, and the question of obtaining a supply of power for general distribution throughout the County was taken up seriously by the County Council. At the time of the Engineers' visit to Goderich this phase of the problem was discussed with several members and officials of the County Council, and from the beginning it was evident that these gentlemen were aware, in a general way, of the unfavorable flow characteristics of the river, and of the doubtful economy of developing Maitland power as an isolated proposition, owing to the comparatively small power capacity available under low water conditions. This led to discussion of the point above mentioned as to whether or not the surplus output of a plant installed to develop power from the higher stages of flow in the Maitland River could be economically supplied as auxiliary power to the Niagara System. It was admitted that from a theoretical standpoint the scheme was perfectly sound, but that exhaustive investigation along engineering and commercial lines would be necessary before a definite course of action could be laid down. As a result of this discussion the members of the Council put forward a proposition, which may be summarized as follows:—

1. For the County Council to acquire, at the expense of the County, all rights and privileges necessary, and to develop power on the Maitland River at such location and in such quantities as the Commission would recommend.

2. For the Commission to purchase the power so generated at cost and to distribute the same throughout the County of Huron over transmission lines built by, and at the expense of the Commission.

3. For the Commission to purchase, also at cost, such surplus power as might be available at different seasons of the year for the use of municipalities connected to the Niagara System.

A preliminary report was then submitted to the Commission outlining the proposal of the County Council and setting forth the various items of data and information which it would be necessary to procure before submitting a final report. These items included:—

1. An estimate of the extent of available market for hydro-electric power in the County of Huron.

2. A systematic investigation of the flow characteristics of the Maitland River, and the resulting power capacities at various seasons of the year.

3. An estimate of the cost of delivered power from the Niagara System, considered as a separate source of power.

4. An estimate of the cost of delivered power from the Maitland River, considered as a separate source of power.

5. An investigation as to the practical and commercial feasibility of combining the above sources of supply and making them jointly or alternately available.

This report contained only one final recommendation which had reference to the site for development. Owing to the small power capacity of the river under conditions of minimum flow, and the consequent necessity of creating as high a head as might be physically possible, it was considered that the site at present controlled by the Maitland River Power Co., known as the "Black Hole," was the best location available for the development of power.

On May 9th, 1911, a special Committee of the County Council of Huron met the Chairman of the Commission in Toronto. During the course of this meeting the members of the Committee were informed that as accurate hydraulic data in connection with the Maitland River was then almost entirely lacking, it would be unwise to submit any final recommendations until the flow characteristics of the river had been systematically investigated for a period of at least one year.

The Commission was asked in the meantime to open negotiations with the Maitland River Power Co., with a view to obtaining a year's option on the Black Hole site, and to report the result of such negotiations, with such other information as might be available, to the June meeting of the County Council.

The result of the Commission's negotiations was an offer from the Company to give a 6 or 12 month option, but the conditions attached and the purchase sum stipulated made it impossible for the Commission to accept the offer on behalf of the County of Huron, as with the data then available there was not satisfactory means of determining what the property was really worth as a site for the development of power. It was therefore thought best to advise the County Council that no recommendations or estimates would be forthcoming until such time as the Commission might be able to issue a final and comprehensive report. Report No. 1, hereto appended, outlines the hydraulic features of the problem, and is based upon such data relating to the flow characteristics of the Maitland River as had been collected up to the time the report was prepared.

Round Lake Storage Dam

For some time past the industries of the Municipality of Renfrew have been suffering severely from a shortage of hydraulic power in the fall and early winter, and at the request of the Council the engineers of the Commission carried out an investigation to determine by what means, if any, the above condition could be alleviated. It was ascertained that the development of storage in the upper watershed of the Bonnechere River, which is the source of power for the Municipality, would materially increase the minimum flow conditions of the stream. Five storage basins were found capable of advantageous development, these being Round Lake, Golden Lake, Clear Lake, Paugh Lake and Robitaille Lake. Of these the most important as regards storage capacity and capability of development was found to be Round Lake, and it was recommended that the development of the system as a whole should be commenced by the construction of a storage dam at the foot of Round Lake. In the winter of 1910 and 1911 a survey was made of this lake to determine the storage capacity and back water damage, and in the fall of 1911 the Commission was requested by the municipality to proceed with the construction of this dam. While the Commission had power, under existing legislation, to build the dam, it had no power at that time to levy tolls to meet the capital, operating and maintenance charges. The municipality was, therefore, informed that in order to proceed with the construction it would be necessary to have an agreement between the Municipality and the Commission whereby the municipality would temporarily be required to meet all charges against the construction and operation of the dam.

In the meantime, plans and specifications had been prepared and tenders called for, all tenders being required to be in the hands of the Commission on or before Nov. 17th, 1911. As the work would require to be done during the late fall and early winter, it was considered advisable to ask parties tendering to submit a schedule of prices based on doing the work during the low water season of the summer and fall of 1912. The following tenders were received:—

Contractors.	Amount of tender.	Date of completion.
	\$	
McCoy & Maguire	5,168 75	February 15th, 1912.
Jennings & Ross.....	5,885 75	March 1st, 1912.
W. A. Moore	6,410 00	March 31st, 1912.
W. W. Wallace	9,369 25	March 21st, 1912.
W. E. Roberts.....	10,048 00	August 1st, 1912.

The only party to put in a tender for summer work was W. A. Moore, and the total of his alternative tender was \$5,262.00, which is about \$100.00 more than the winter tender of McCoy & Maguire.

Although the Municipality was informed that the above agreement was required only to enable the Commission to proceed at once with the construction, and that subsequent legislation enabling the Commission to levy tolls would relieve the municipality of the obligations which it involved, it was not until January, 1912, that the agreement was finally signed. This delay, of course, made it necessary to hold over the construction until the summer of 1912, and as the tender of McCoy & Maguire was the lowest, irrespective of season, the contract was awarded to this firm. In the meantime, the senior member of the firm had withdrawn and a contract for construction was drawn up between the

Commission and C. D. Maguire, the same being signed on May 20th, 1912. A copy of this contract with the tender and specifications is appended hereto under Report No. 2. The contractor started work in July and although the contract called for the completion of the work by Sept. 15th, 1912, it is still far from complete. The reason for this is due, to a certain extent, to the abnormally high water conditions which have obtained during the past summer and to the rainy weather, but the chief cause for delay has been the condition of the labor market. Since the time the work started the contractor has kept in touch with all the labor centres in Ontario as well as in Montreal, and although he offered a higher rate for common labor than obtained elsewhere, he has found it absolutely impossible to obtain a sufficient working corps to carry out the work properly. The result has been that he has had to depend almost altogether upon such unskilled labor as he could obtain in the immediate neighborhood of the work. A further cause for delay was due to the discovery of a fault in the rock formation after the work had been started. This necessitated an alteration in the foundation plans of the dam, and while this entailed some additional expense, it would not have caused serious delay had an adequate supply of labor been available.

North Bay

The lighting franchise of the North Bay Light, Heat and Power Co., expired on Sept. 13th, 1911, and by resolution of the Municipal Council the Commission was requested to investigate conditions and advise the town in the matter of purchasing the plant of the above Company and installing a municipal distribution system. In connection with this scheme, the Commission was also asked to recommend the best source from which the municipality could obtain power for the operation of this system. In 1908 the Commission submitted a report to the municipality dealing with the development of power at Smoky Falls on the Sturgeon River and the transmission of same to North Bay. Smoky Falls, still being considered the best available source of power for the municipality, the estimates of the 1908 report were revised to suit present conditions and the cost of low tension power delivered in North Bay was ascertained, the quantities of power upon which the prices were based being the full capacity and half capacity of the site respectively. (See Report No. 3 appended hereto).

Wingham

Under date of November 12th, 1910, the Council of the Municipality requested the Commission to report upon the possibility of developing power on the Maitland River for the use of the town. A preliminary investigation showed that the only site worth considering was located about six miles from the town in the neighborhood of the Curry Farm. No natural head existed at this point and in order to investigate the merits of the scheme a survey was necessary. This survey was made in November, 1911, and a plan prepared showing the amount of land which should be affected by back water in the event of developing a 15 ft. head. This plan was forwarded to the municipal authorities under date of May 12th, 1911, with a letter stating that further information in connection with the scheme of development could not be given until some data had been collected during the coming summer in connection with the minimum flow of the stream. Discharge measurements were made at the proposed site of development from June till December, 1911, and the final Report No. 4, appended hereto, was submitted under date of Jan. 2nd, 1912.

Parry Sound

The Municipality of Parry Sound has a hydro-electric plant upon the Seguin River which at the present time is carrying a load that requires the full minimum flow of the stream. A smelting industry is now being established in Parry Sound which will require more power than the municipality is now able to develop, and under date of January 8th, 1912, the Municipal Council forwarded a resolution to the Commission asking that the power conditions in Parry Sound be investigated with a view to recommending the best means of augmenting the present supply of Hydro-Electric power. As negotiations with the promoters of the smelting industry were in progress at the time, the municipality wished to have a report prepared with as little delay as possible. A preliminary investigation was therefore made at once and sufficient information was obtained to demonstrate that the power capacity of the Seguin River could be materially augmented through the development of an artificial storage system in the upper water-shed. The Provisional Report No. 5 hereto appended was submitted, covering these preliminary investigations, and in June, 1912, a reconnaissance survey of the Seguin River water-shed was made. This survey in most cases confirmed, and in some cases bettered, the findings of the Provisional Report and demonstrated beyond reasonable doubt that the development of a storage system in the Seguin River water-shed would materially augment the power capacity of the stream. (See Report No. 6, appended hereto).

Algoma Power Co.

In April, 1912, the Algoma Power Company submitted plans covering the development of a comprehensive scheme for artificial storage in the water-shed of the Michipicoten River. In addition to the development of the storage in the water-shed of the Michipicoten River this scheme contemplated the diversion of the run-off of the water-sheds tributary to Oba Lake and Missinaibi Lake into Michipicoten waters. These two lakes are at the present time tributary to, and form part of, the water-shed of the Kenogami and Missinaibi Rivers respectively.

It was held that the Province would not incur any serious risk in approving the outline of the scheme for conservation in the Michipicoten water-shed, as the interests of the Province could be protected sufficiently by requiring the company to submit all construction plans for approval, and taking such steps as might be necessary to ascertain whether or not the work of construction was being carried on in a proper manner. In the matter of the proposed diversion of the Kenogami or Missinaibi waters it was held that this should not be allowed as a matter of principle, and not at any rate until such time as the Algoma Power Company could show evidence that the additional power to be derived from such diversion was urgently required.

Markham

In April, 1912, the Council of the Village of Markham requested the Commission to report upon the advisability of purchasing two power sites on Rouge Creek in the vicinity of the village, and as to the possibility of developing these two power sites either separately or in combination for the requirements of the municipality. The village at the present time owns a steam plant which supplies the lighting load, and through the purchase of the two dams above mentioned they proposed to reduce the cost of producing power for municipal purposes and also hoped to have a small quantity of industrial power available for sale. The municipality was informed at the time of the preliminary investigation that the Com-

mission could not take the responsibility of rendering an immediate decision owing to the entire lack of reliable information as to the power capacity of the stream, and that for this reason it would be necessary to carry on an investigation during the coming summer in order to obtain necessary data on which to base a report. During the summer a survey was made in order to ascertain what back water damage would be involved by concentrating the total head at the lower dam, and discharge measurements were taken at regular intervals during the summer and fall. Report No. 7, appended hereto, sets forth the conclusions arrived at as a result of these investigations.

Alliston

In the spring of 1912, the Municipal Council of Alliston made application to the Commission for advice as to the purchase of the privately owned power plant which at the present time is supplying light in the municipality. During the spring flood of 1912, the Company's dam was practically destroyed, as was also the concrete storage tank which was used for gathering the water supply of the municipality from two artesian wells on the bank of the river. The Town wished the Commission to recommend some course of action immediately, as it was necessary to repair the water works system without delay, and it was not thought desirable to do any work which would require to be undone or would add in any way to the expense necessary to consolidate the water and electric utilities in the event of the latter being purchased. A method of procedure was outlined by which the town could permanently install a system of suction and discharge mains without in any way affecting the cost of consolidation at a later date, and having agreed to this the Municipality was willing to wait until sufficient information had been collected with regard to the private company's plant to justify a final report. Since that time steps have been taken to obtain flow measurements and data in connection with various available sources of power in the vicinity of the town.

Smith's Falls

At the request of the Council of the Municipality of Smith's Falls the engineers of the Commission made an investigation of the existing conditions in the Municipality in connection with the extent of the available market for Hydro-Electric power and the source from which such power could best be obtained. The situation in Smith's Falls was complicated owing to the existence of two independent companies which were supplying light, heat and power to the Municipality in competition with each other. Both these companies have power developments on the Rideau Canal and both use auxiliary steam. Report No. 8, appended hereto, outlines the power situation as regards the Rideau Canal and also submits recommendations as to where additional power might be obtained if required.

Meaford

During the spring flood of 1912 the dam of the Georgian Bay Power & Milling Co., on Big Head Creek near Meaford was partially destroyed and the company submitted a proposition to the Municipality for the purchase of the entire system. The Municipality applied to the Commission for advice, and as it was necessary to take some action immediately the Municipality was advised to ask for a six months' option on the property in consideration for which they would put such temporary repairs upon the dam as would enable the plant to resume operation. It was thought by the time this option had expired that the

Commission would be in a position to advise the Municipality as to whether or not it would be in its interests to accept the company's offer. The Municipality took no action in the matter and the proposition was abandoned. The company subsequently obtained a franchise for the distribution of light and power in the Municipality and put the necessary repairs upon the plant at their own expense. Report No. 9, appended hereto, deals with the physical condition of the plant and discusses the advisability of the purchase by the Municipality.

Chesley

Under date of March 31st, 1911, a Resolution of the Municipal Council of Chesley was forwarded to the Commission requesting a report as to the commercial feasibility of developing power for municipal purposes on the North branch of the Saugeen River in the vicinity of the town. The Commission's engineers accordingly made certain surveys and for some months carried on investigations with a view to ascertaining whether the minimum flow of the river could, with the maximum head available, supply a sufficient quantity of power to meet the requirements of the Municipality at reasonable cost. Report No. 10, appended hereto, was submitted to the Municipality in this connection, but owing to the unusual flow conditions which appeared to exist, this report was submitted subject to correction, and periodical flow measurements are still being taken in order to ascertain whether or not this report sets forth the true conditions as regards minimum flow.

Dufferin Light & Power Co.

This company was organized to develop power and transmit and distribute the same to the Municipalities of Orangeville, Shelburne, Dundalk and neighboring municipalities. When the matter came before the Commission the company had a partially completed generating plant on the Pine River about three miles from the village of Horning's Mills. Financial difficulties had caused a suspension of work on this development and it was thought advisable to investigate the scheme in order to ascertain whether or not it would be possible for the Commission to take over the generating plant and lines of the company and supply power to the above mentioned municipalities in the same manner in which it is being supplied at the present time by the Niagara System.

At the time of examination the company had under construction a large earth-fill dam designed to provide a pondage area of about 100 acres. The water was to be carried to the wheels through about 1,200 ft. of wood flume, and 2 300-h.p. wheels were at that time installed which are intended to operate under an effective head of about 125 ft. The minimum flow of the stream is such that the continuous 24 hour capacity of the plant would not be more than 250 h.p. The company's financial difficulties were finally solved when its assets were put up at auction and were bought in by a combination of the original bond-holders, and immediately following the purchase a contract was let for the completion of the development.

Owing to the small quantities of continuous power available, it was clearly not a proposition which the Commission could handle to advantage, as the only means of deriving an adequate revenue from such a restricted output was to confine the market exclusively to the sale of light and restricted hour power in very small units in order that the fullest possible advantage could be taken of a peak load capacity which is made available by reason of the combination of a high head and the comparatively large capacity of local pondage.

County of Ontario

In June, 1912, a number of the municipalities in the County of Ontario made application to the Commission to be supplied with Hydro-Electric power. A preliminary investigation by the Commission in response to this application indicated that it might be feasible to supply the requirements of this territory from a development upon the Severn River about three miles from the Village of Washago. This power site, which is known locally as Wasdell's Falls, belongs at the present time to Adam Dobson, Esq., of Cannington. The head obtainable will vary from 11 to 15 ft. according to the stage of flow, and under minimum conditions this site should be able to supply from 750 to 1,000 h.p., which amount of power should be quite capable of supplying the requirements of the County of Ontario for some time to come. A cursory examination of the site showed topographical conditions to be such that fairly cheap development was possible,



Wasdell's Falls.

and during the summer a detailed survey was made to enable the engineers of the Commission to lay out a scheme of development and make estimates of cost. Periodical measurements of flow are also being made and gauges have been established at the site in order to keep a record of the variations of natural head. In the near future it will therefore be possible to prepare estimates and plans of a sufficiently definite nature to indicate whether or not the scheme is economically feasible.

Burnt River

The storage capacity of the lakes in the upper watershed of the Burnt River is being developed by the Dominion Government in connection with the Trent Valley Canal projects. As the development of this storage will have a tendency to produce uniform flow conditions in the Burnt River, it was thought advisable to ascertain if there were any power sites on the river which might at some future time be of use to the Commission. Report No. 11, appended hereto, deals with this matter in a preliminary way.

Dog Lake Storage Dams

The construction of the Dog Lake Storage Dams was completed in March, 1911, and since that time they have been in active service. The level of Dog Lake was drawn down very low for purposes of construction so that in the spring of 1911 the dams were called upon to do their full duty. In March, 1912, however, the water was at a stage about 1 ft. above normal summer level and the spring flood put about 2 ft. of water on the crest of the overflow dam and required a discharge of about 4 ft. in depth over the stop logs in the regulating dam to hold the water to the maximum flood level. It was anticipated that the erosive action of the falling water might do some damage to the sluice aprons between the piers, and in September, 1912, one of the engineers of the Commission inspected the dams to ascertain what damage, if any, had been done. No evidence of injury to the apron by the action of water or ice was found. A few small leaks were discovered through unclosed fissures in the bed rock, but none were of sufficient size to give cause for anxiety. The gate rods on the swivel gates were too light for the pressure to which they were subjected and some of them were bent out of line between guides. This causes considerable leakage through the gates but otherwise does no damage. As regards the rock-fill dams there has been considerable settlement of the fill on both sides of the core wall, but as both dams are quite water-tight, and as the fill was placed with an ample factor of safety this condition is not serious, as it affects only the appearance of the structure. Up to the present time the dams have shown themselves quite capable of fulfilling the requirements for which they were designed.

Mountain Lake

A fair market for power exists in the Town of Picton, and the Trent River is the nearest available source from which any considerable quantity of power could be obtained. The Town of Picton is so situated that the transmission costs from the nearest available source of power on the Trent River would be high, and for this reason it was considered advisable to ascertain if there was any possibility of obtaining an adequate supply of power from some more accessible source. The Mountain Lake site was examined with this object in view. This lake is situated at the top of a high hill on the southern shore of Picton Bay about 4 miles from the Town of Picton. The water-shed tributary to this lake is insignificant and the quantity of power which is being developed at the present time by the owners of the property proves beyond a doubt that this lake is fed from some underground source of supply. Before reaching any decision as to the adaptability of this site for the requirements of the Town of Picton it was necessary to form some idea of the magnitude of this source of supply. An experiment was, therefore, devised and carried out during the month of September, which is described in Report No. 12. hereto appended, together with the conclusions derived.

Thornbury

During the spring flood of 1912 a dam on the Beaver River in the Village of Thornbury, jointly owned by Messrs. Andrews Bros. and Parkinson, was destroyed. Andrews Bros. used a portion of their share of the power to supply light to the village and since the destruction of the dam the village has been without electric service. During the past summer the village purchased the two-thirds interest of Andrews Bros. in this power and the two parties are proposing to build a new dam on or near the site of the old structure to ultimately control a head of about 25 ft. The Municipal Council applied to the Commission for assistance in connection

with the scheme and it was found that the parties were proposing to proceed at once with the construction of a masonry dam. Such preliminary plans as were available indicated that the dam was designed for a solid rock foundation, whereas the foundation material available at the proposed site is a thick stratum of blue clay overlying hardpan. The members of the Municipal Council were informed that it was not practicable to build a dam of this type in Thornbury without very material modifications in the design. They were also informed that it would be quite impossible to make the necessary surveys and proper plans in time to permit of construction during the fall of 1912. In view of this it was decided that if any immediate action were taken nothing more would be done than to carry out such temporary repairs to the existing dam as would ensure fairly efficient operation of the machinery at present installed during the coming winter.

Sault Ste. Marie

Up to the present time the water and light utilities in the Town of Sault Ste. Marie have been owned and operated by the Tagona Water and Light Co., which is a subsidiary company of the Lake Superior Corporation of Sault Ste. Marie. The water and light franchises expire in the fall of 1914. Under these franchises the Municipality has the option of renewing the same for a further term of years or of purchasing the water and light systems at the expiration of the present term. Under date of June 3rd, 1912, a Resolution of the City Council was forwarded to the Commission, asking to have all conditions enquired into with a view to advising the Municipality as to what steps to take when the time came to consider the renewal of the franchises and the matter of purchasing the water and light systems. The Lake Superior Corporation has recently undergone a re-organization and at the present time the efforts of the management are directed almost altogether towards the development of their steel and pulp industries, and the affairs of the Tagona Water and Light Co. have, up to the present time, received only casual consideration. On this account, and also owing to the fact that the franchise will not expire for two more years, the Municipality was advised to wait until the officers of the company were in a position to either make or receive a definite proposition in connection with the water and light utilities. There is considerable anxiety felt in the city in connection with the water supply, as the intake is so located that there is great danger of pollution, and this condition will become more serious as the company's industries extend. The Municipality was advised to at once employ the services of an engineer to report upon the danger of pollution by reason of the present location of the intake and to advise the Municipality as to what steps, if any, would be necessary to ensure a supply of uncontaminated water. The Municipality was advised to obtain this report as soon as possible, as the conclusions arrived at would have an important bearing upon future negotiations with the Tagona Water and Light Co. in connection with the purchase of their waterworks system.

Fort Frances

Under date of June 11th, 1912, the Municipal Council of Fort Frances forwarded a Resolution to the Commission, asking for a report upon the possibility of obtaining the industrial power in commercial quantities from a proposed development at Foot Print Rapids on the North-west River, this site being some 20 miles from the town. During the month of September a preliminary survey was made of this site and information obtained which appeared to indicate that the

site would not have sufficient continuous power capacity to warrant development, and a survey of another possible site upon Big Turtle River was made in order that an alternative proposition might be submitted. All information necessary for a preliminary report is now available.

Lake of the Woods

Under date of May 13th, 1912, the Commission received a copy of a reference sent by the United States Department of State to the Government of Canada, as quoted hereunder:—

“I have the honor to inform you that at the joint request of the Government of the United States and of the Government of the Dominion of Canada, under the provisions of Article No. 9 of the Treaty of Jan. 11th, 1909, between the United States and Great Britain, the questions or matters of differences set forth below which have arisen between them involving the rights, obligations or interests



Kettle Falls, International Channel.

of each in relation to the other, or to the inhabitants of the other, along their common frontier between the United States and the Dominion of Canada, are hereby referred to the International Joint Commission for examination and report upon the facts and circumstances of the particular customs and matters referred to, together with such conclusions and recommendations as may be propounded.”

The questions so referred are as follows:—

1. “At what level is it desirable to maintain the surface of the Lake of the Woods during the different seasons of the year in order to secure the most advantageous use of its waters on each side of the boundary for domestic and sanitary purposes, for navigation and transportation purposes, for fishing purposes, for power and irrigation purposes, and also in order to secure the most advantageous use of the shores and harbors of the lake and of the waters flowing into and from the lake?”

2. “If the level recommended in answer to Question No. 1 is higher than the normal or natural level of the lake, to what extent, if at all, would the lake, when

maintained at such level, overflow the low-lands upon its southern border or elsewhere on its border, and what is the value of the lands which would be submerged?"

3. "In what way or manner, including the construction and operation of dams for other water works at the outlets and inlets of the lake or otherwise, is it possible and advisable to regulate the volume, use and outflow of the waters of the lake so as to maintain the level recommended in answer to Question No. 1, and by what means or arrangement can the proper construction and operation of regulating works, or system or method of regulation, be best secured and maintained in order to ensure the adequate protection and development of all the interests involved on both sides of the boundary, with the least possible damage to existing rights and interests, both public and private, which may be affected by maintaining the proposed level?"

The above reference was submitted by the Federal Government to the Province of Ontario in view of the magnitude of the interests which the Province had involved, and the Province immediately signified its intention of giving the matter serious consideration. In July the Commission's Hydraulic Engineer accompanied the Consulting Engineer of the Canadian Section of the International Joint Commission upon an inspection trip through Rainy Lake, Rainy River, Lake of the Woods and the Winnipeg River. At the conclusion of this trip a joint memorandum was prepared outlining an extensive scheme of engineering procedure which must necessarily be carried out in order to properly satisfy the queries of the above reference. It was proposed that the engineer of the Joint Commission, an engineer of the Water Powers branch of the Dominion Department of the Interior and the Hydraulic Engineer of the Power Commission should co-operate in the matter of obtaining this information, which information was to be mutually exchanged. Following this plan the engineers of the Manitoba Hydrographic Survey, with headquarters at Winnipeg, were instructed to proceed immediately with the collection of such data as they had access to, and the other parties to the agreement were deputed to obtain certain items of necessary information from various departments of the Federal and Provincial Governments.

In September, 1912, the International Joint Commission held official hearings at International Falls, Minn.; Warroad, Minn.; and Kenora, Ont., in connection with the above reference. A large volume of local evidence was taken at these hearings, but it was understood that the Commissioners had no intention of employing the evidence obtained for the purpose of rendering an immediate decision, and the Chairmen of both sections of the Commission made it plain that it was their intention to wait for the report of the engineers before formulating any policy in connection with the regulation of the waters of the Lake of the Woods water-shed.

Bancroft

Under date of March 14th, 1912, the Municipality of Bancroft forwarded a Resolution to the Commission requesting a report concerning the proposed purchase of a power site on the York River within the limits of the village. This power had been used for some years as a mill power, but last January the two woollen mills, the machine shop and the electric light plant were destroyed by fire. One of the woollen mills has since been rebuilt but no action has been taken in regard to the re-establishment of the other industries. In August, 1912, a survey of this power site was made by the engineers of the Commission and a report covering the whole question of the supply of power to the Municipality is being prepared.

Kearney

Under date of February 17th, 1912, the Council of the Municipality of Kearney forwarded a Resolution to the Commission asking for a report upon the possibility of developing power at Brooke's Falls on the Magnetawan River for the use of Kearney and neighboring municipalities. The power site was visited in September, 1912, and the topographical conditions at the site, together with the market possibilities of the Village of Kearney, indicated that the proposition merited some further consideration. A survey of the power site is now being made and a final report will be submitted to the parties interested at the first opportunity.

Grand River

Through the influence of drainage, cultivation and deforestation the flood flow of the Grand River for some years past has been steadily increasing in volume and destructiveness. Consequent upon this steady increase in flood discharge the



Brooke's Falls.

minimum flow of the stream has been as steadily decreasing, and the Grand River is gradually assuming the characteristics of a torrential stream. For some time the municipalities located along the course of the river have been agitating for the construction of storage works in the Grand River water-shed for the joint purpose of ameliorating flood conditions and for increasing the power capacity of the river under conditions of minimum flow. The topographical features of the Grand River water-shed are such that the creation of storage reservoirs of adequate capacity would entail very great expense, primarily through the lack of natural storage basins, and secondly through the lack of accessible solid foundation material for dams. During the past summer a reconnaissance survey has been made of the whole water-shed of the Grand River above Brantford, Ontario, and all points where storage dams might possibly be placed have been located in a general way. These locations are now being examined in detail, and if this preliminary survey indicates that material benefit is to be derived from the creation of storage works, a detailed survey will be recommended, upon which to base a definite scheme of conservation.

Thessalon and Bruce Mines

Under date of July 2nd, 1912, these Municipalities requested a report from the Commission upon the possibility of developing power on the Mississauga River for the joint use of the municipalities. The Fifth Hydraulic Report of the Commission contains an estimate of the cost of delivering certain stated quantities of power to Thessalon and Bruce Mines from Slate Falls on the Mississauga River. Subsequently in 1908 the Commission submitted a report to the Municipality of Bruce Mines dealing with the possibility of delivering certain quantities of power to the Municipality from a development at Squaw Chute on the Mississauga River. In view of the above it was not considered advisable to prepare any more preliminary estimates for these municipalities, but rather to make a canvass of the actual



Saugeen River. Bridge Station.

existing market, and if the demand for power was sufficient to ensure a reasonable unit cost for delivered power the Commission would take steps to lay out a definite scheme of development and transmission for the service of these municipalities.

Hydrographic Surveys

During the past year an effort has been made to obtain some knowledge of the regimen of some of the more important rivers in the Province, and to this end two members of the Commission's engineering staff have been almost continuously employed on stream measurement. At the present time 17 rivers are under observation and monthly measurements of flow are made at one or more points on these rivers, but only in some cases are daily records of water level being kept. The record of all stream measurements to date will be found in tabular form in the appendix of this report.

It may be noticed that in many cases the relation between gauge-height and discharge is not such as to produce a smooth rating-curve. This is due primarily to the fact that it has been necessary in many cases to use a wide, shallow and frequently a rough cross-section for purposes of measurement, and a small variation in gauge-height on such a section will produce a large variation in discharge, which the nature of the section makes it difficult to measure accurately. The second reason is that the water-levels have in most cases been determined by various means from reference bench-marks instead of from direct reading gauges. The latter element of inaccuracy will be largely eliminated by the proper installation of gauges from which daily records of water-level can be derived. Owing to the unsatisfactory operation of the ordinary type of wooden staff-gauge, the work of



South River, Bridge Station.

installing permanent gauges has been held up pending the receipt of information from the Water Resources Branch of the U. S. Geological Survey, and the Water Power Branch of the Dominion Department of the Interior. The former organization has introduced a cast iron, and the latter an enamelled steel gauge to take the place of the wooden type, and advantage will be taken of their experience in carrying on this very important branch of hydrographic study.

These records are an outcome of the large number of requests received from various municipalities throughout the Province for reports on the possibility of developing local water-powers for municipal needs. The Commission was obliged to meet a large number of these requests either by submitting a preliminary report based upon assumptions of an approximate and unsatisfactory nature, or by holding up the report for a year or more to allow time for the collection of a reasonable amount of dependable data relative to the case under consideration. The

hydrographic work originally undertaken with this object in view has been continued with the primary object of confirming or disproving, as the case might be, the conclusions set forth in the above mentioned reports. A number of rivers have also been added to the list in anticipation of enquiries to be received from various municipalities for which they are the natural source of power.

In conclusion it may be said that the proper administration of the water resources of the Province depends upon a definite knowledge of the value of all water powers which are capable of commercial development, either now or at some future time. In appraising the value of these water powers some knowledge of the flow characteristics of the streams upon which they are located is absolutely essential. For this reason alone, if for no other, any expense necessary for the proper collection and compilation of hydrographic records is amply justified.

REPORT NO. I.

Maitland River

The natural source of power for the County of Huron is the Maitland River, which rises on the height of land between Lake Erie and Georgian Bay, and flows into Lake Huron through the Town of Goderich. The water-shed of this river is about 950 sq. miles in extent, and is largely drained and deforested. As a result, the natural flow characteristics have been destroyed, and the water-shed of the Maitland River, in common with the water-sheds of other rivers in the south-western peninsula, has an uncontrolled run-off which produces heavy Spring freshets, and a consequent low discharge during the late Summer and early Autumn periods.

The abnormal flow characteristics of the Maitland River to a large extent discount its value as a source of power, the more so by reason of the fact that its water-shed is almost entirely lacking in natural storage basins. The country throughout the whole area is cleared and for the most part cultivated, so that the land damages and construction costs in connection with the establishment of remedial works of sufficient magnitude to adequately offset the effects of drainage, cultivation and deforestation would be prohibitive. In view of this fact, the power possibilities of the Maitland River, considered as an independent source of continuous power, can only be discussed on the basis of minimum flow, in conjunction with such advantages as can be derived from local pondage.

The total drop of the Maitland River from headwaters to mouth is approximately 900 feet, but the topography of the water-shed is such that no natural heads of any consequence exist, the gradient of the river-bed being fairly uniform and the average velocity high. As a result, power can only be developed by diversion or by the creation of an artificial head, or by a combination of both methods. This condition, in conjunction with the poor run-off regulation, will tend to make power development expensive, and to increase the annual cost of power.

The above general facts and the general conclusions deduced therefrom, comprised practically the sum total of all hydraulic data in connection with the Maitland River which could be safely used when the Huron County scheme first became a definite issue. The proper consideration of the scheme, therefore, necessitated at the outset a systematic investigation of the flow characteristics of the Maitland River. Owing to the desire of the County authorities to have a report at the earliest possible date, it was decided to carry on the hydraulic investigations for one year only, the understanding being that any conclusions arrived at by the end of that period should not be considered as final, but merely as indicating reasonable possibilities. The extent to which this end was attained will now be considered.

Early in May, 1911, a gauging station was established at Ben Millar, and since that date monthly measurements of flow have been made, and in connection with these measurements daily records of water level were also obtained.

The records obtained up to the present time are tabulated hereunder:—

Date of Measurement.	Discharge.	Water Level.	Electric h p. per foot of head.
May 19, 1911.....	979 cu. ft per sec.	14.27	82 h.p.
June 14, 1911.....	549 " "	13.80	46 "
July 20, 1911.....	305 " "	13.60	25 "
Aug. 11, 1911.....	170 " "	13.37	14 "
Sept. 18, 1911.....	172 " "	13.39	14 "
Oct. 16, 1911.....	257 " "	13.55	21 "
Nov. 20, 1911.....	4,068 " "	15.34	340 "
Dec. 22, 1911.....	1,280 " "	14.30	107 "
Jan. 27, 1912.....	752 " "	Ice	63 "
Feb. 29, 1912.....	506 " "	Ice	42 "
Mar. 28, 1912.....	2,116 " "	Ice	176 "
April 6, 1912.....	41,000 " "	20.26	3,420 "
April 7, 1912.....	65,000 " "	21.60	5,420 "
April 26, 1912.....	1,437 " "	14.40	120 "
May 30, 1912.....	5,815 " "	16.13	485 "
Estimated extreme minimum on August 30, 1911	120 " "	13.18	10 "

The last item in the above table is inserted by reason of the fact that there was no actual measurement of flow taken when the water-level reached its lowest stage of 13.18 at Ben Millar, as evidenced by the daily records. The estimated discharge of 120 cubic feet per second is considered to be a generous one and is to be considered the minimum volume of flow so far recorded.

The flow characteristics of the river during the term covered by these records may be summarized as follows:—

(1) The minimum run-off of the water-shed was about .125 cubic feet per second per square mile.

(2) The maximum run-off of the water-shed was about 68 cubic feet per second per square mile.

(3) The ratio of minimum to maximum flow was as 1 to 543.

(4) The low stages of flow occurred during the months of July, August, September and October.

(5) The intermediate stages of flow occurred during the months of November, December, January, February, March and June.

(6) The high stages of flow occurred during the months of April and May.

These records also indicate:—

(1) That the river is extremely sensitive to the effects of rain-fall.

(2) That the river is seriously deficient in ground storage capacity.

(3) That deforestation, cultivation and drainage have so accelerated the run-off that the ground storage of the water-shed can never be filled to its natural capacity. The falling off in discharge from 65,000 sec. ft. on April 7th to 1,437 sec. ft. on April 27th plainly indicated the existence of this condition.

The records so far obtained seem to indicate, therefore, that the discharge of the Maitland is mainly dependent upon surface run-off, and the power capacity of the river from month to month will vary almost in proportion to the monthly precipitation on the tributary water-shed. This contention is borne out by the evidence of the May discharge. On May 19, 1911, there was 82 h.p. per foot of head at Ben Millar, with the May precipitation slightly below normal. On May

30, 1912, there was 485 h.p. per foot of head at Ben Millar, with the May precipitation 300 per cent. above normal.

This intimate relation between rain-fall and power capacity indicated the necessity of determining what relation the monthly precipitation during the year covered by the records bore to that of previous years, and precipitation records from all meteorological stations located in or adjacent to the Maitland River watershed were obtained with this object in view. These records proved to be so disconnected and otherwise unsatisfactory that an exhaustive analysis of the same would have been useless. The figures relating to precipitation have, therefore, a low degree of accuracy, and are submitted only because of the impossibility of procuring more reliable data.

The figures in the table below were compiled from precipitation records taken at Goderich for 36 years, at Clinton for 8 years, at Mount Forest for 7 years, at Stratford for 16 years, at Lucknow for 27 years, and at Listowel for 10 years. The first column contains the average of all records of monthly precipitation to date, and the second column contains the precipitation for the corresponding months during which the flow characteristics of the Maitland were being investigated.

General average monthly precipitation for all years.	Monthly precipitation during months of measurement.	Difference—	
		Above average.	Below average.
January, 3.55 inches	(1912) 4.70 inches..	1.15	.....
February, 2.95 "	(1912) 2.12 " ..		0.83
March, 2.62 "	(1912) 1.59 " ..		1.03
April, 2.15 "	(1912) 2.10 " ..		0.05
May, 2.93 "	(1911) 2.71 " ..		0.22
June, 2.91 "	(1911) 2.02 " ..		0.89
July, 2.91 "	(1911) 1.90 " ..		1.01
August, 2.47 "	(1911) 2.59 " ..	0.12	.....
September, 2.86 "	(1911) 3.71 " ..	.85	.....
October, 3.39 "	(1911) 4.45 " ..	1.06	.....
November, 3.49 "	(1911) 4.33 " ..	.84	.....
December, 3.48 "	(1911) 2.13 " ..		1.35

It will be seen from the above that the monthly precipitation during the year of investigation fell below the general average during the months of February, March, April, May, June, July, and December, and was above the general average during the months of August, September, October, November and January.

While, as previously stated, the reliability of the precipitation data is questionable, several deductions can be drawn from the above figures which have a certain value.

These deductions may be itemized as follows:

1. The average precipitation for the three winter months of December, January and February from the above table is 9.98 inches. The precipitation for this period in 1910-11 was 9.46 inches, or 0.52 inches below the average. The precipitation for the corresponding period in 1911-12 was 8.95 inches or 1.03 inches below the average. It is to be inferred from this that there was a greater volume of Spring run-off during the Spring of 1911 than there was in the Spring of 1912. This condition should reasonably be expected to produce a greater Summer flow in 1911 than in 1912, on account of the fuller replenishment of ground storage.

2. The average precipitation for the three months of March, April and May is 7.70 inches. The precipitation for this period during 1911 was 8.21 inches, and for the same period in 1912 was 10.54 inches, being therefore 0.51 inches above the average for 1911, and 2.84 inches above the average for 1912. Under these conditions the tendency would be to produce a Spring discharge in the Maitland slightly above the average in 1911, and considerably above the average in 1912. This should also have a tendency to make the Summer flow for 1911 less than the Summer flow for 1912, but slightly more than the average.

3. The average precipitation for the three Summer months of June, July and August is 8.29 inches. The precipitation for the Summer months of 1911 was 6.51 inches, or 1.78 inches below the average. The tendency would, therefore, be for the production of a Summer discharge below the average during 1911.

4. The average precipitation for the three Autumn months of September, October and November is 9.74 inches. The precipitation during the Autumn months of 1911 was 12.49 inches or 2.75 inches above the average. The tendency of this condition would be to produce an Autumn discharge greater than the average in 1911, and also to produce a discharge greater than the normal during the Winter months of 1911 and 1912.

Applying these deductions to the flow characteristics found by measurement during the years of 1911 and 1912, the following conclusions are derived:—

1. The Winter precipitation for 1910-11 was slightly less than the average but greater than the Winter precipitation for 1912, the tendency being therefore to produce a Summer flow in 1911 slightly above the average, and greater than the Summer flow for 1912.

2. The Spring precipitation for 1911 was slightly greater than the average but much less than the Spring precipitation for 1912, the tendency being, therefore, to produce a Spring run-off and consequently a Summer flow, slightly above the average in 1911, but less than would obtain in 1912.

3. The Summer precipitation for 1911 was considerably below the average, the tendency therefore being to produce a Summer flow less than the average.

4. The Autumn precipitation for 1911 was considerably above the average, the tendency being to produce an Autumn and Winter flow greater than the average.

As regards Summer flow in 1911, we have therefore two factors, the Winter and Spring precipitation and the Spring run-off tending to make it a maximum through the effect of ground storage, and one factor, the Summer precipitation, tending to make it a minimum by reason of a Summer run-off which was below the average. Inasmuch as surface flow is assumed to be the governing factor as regards the discharge of the Maitland River, it may be reasonably stated that the Summer discharge for 1911 was really below the average, and also that the Summer discharge for 1912 may be expected to be greater than that of 1911 and possibly above the average.

In the matter of Autumn and Winter flow, that shown by measurement during 1911 and 1912 is probably much greater than can ordinarily be expected, as the Autumn precipitation was so much in excess of the average. Smaller values for discharge are to be anticipated during the coming Autumn and Winter if, as seems probable, the precipitation more closely approaches the average.

To conclude this portion of the argument it may be said that, as regards the flow characteristics of the Maitland River, the outstanding features are, first, its sensitiveness to the effects of rain-fall, and, secondly, its dependence upon sur-

face run-off as against ground storage. Therefore, while the conclusions above set forth may cover the general behaviour of the river over a cycle of years, the occurrence of abnormal or unusual precipitation phenomena during some particular season may give rise to temporary conditions of flow, the nature of which it is not now possible to anticipate.

The initial decision that the Black Hole power-site was the best suited to the requirements of the Commission and the County of Huron is amply justified by the results of the subsequent investigation. The minimum capacity of 10 h.p. per foot of head proves the necessity for developing under the highest possible head that topographical conditions will permit and that capital cost will justify, and also for choosing a site providing the best facilities for pondage in order to make peak load and daily storage capacity a maximum. The Black Hole site, with an operating head of 80 feet, and something over 700 acres of pondage obtainable, fulfils the required conditions more satisfactorily than any other possible location on the lower river and has been considered to the exclusion of all others.

Referring back to the table of discharge measurements, the power capacity of the Black Hole site, under an 80 foot head, upon the various dates of flow measurement, would be as follows:

Date of measurement.	Continuous 24 hour power capacity.	Probable combined 10 hour and 24 hour capacity.
May 19, 1911	6,560 E.H.P.	10,000 E.H.P.
June 14 "	3,680 "	5,800 "
July 20 "	2,000 "	3,200 "
Aug. 11 "	1,120 "	1,800 "
Aug. 30 " (minimum)	800 "	1,200 "
Sept. 18 "	1,120 "	1,680 "
Oct. 16 "	1,680 "	2,400 "
Nov. 20 "	27,200 "	38,000 "
Dec. 22 "	8,560 "	12,000 "
Jan. 27, 1912	5,040 "	7,100 "
Feb. 29 "	3,360 "	4,700 "
Mar. 28 "	14,080 "	21,000 "
Apl. 26 "	9,600 "	15,400 "
May 30 "	38,800 "	62,000 "

Considering the above figures in connection with the conclusions derived from the study of precipitation, the following general statements with regard to power capacity would seem justifiable:

1. The Spring flow will, under all circumstances, produce power in excess of economic installed capacity.

2. The Summer flow was probably close to the minimum during 1911 and a larger Summer power capacity may be anticipated under average conditions.

3. The Autumn precipitation and late Autumn flow was considerably in excess of the average, so that the power capacities established by measurement during the Autumn and Winter of 1911-12 cannot be considered normal, and conditions much less favorable should frequently obtain.

Considering the power capacities in connection with the market demand, it is evident that even under average conditions, the Summer power capacity of the Black Hole site will not be sufficient to carry the Huron County load, so that some portion of it will always have to be carried by Niagara during the Summer season, and probably at times in the early Autumn. Also while the Autumn and Winter capacity may at all times be sufficient to carry the Huron County load, it is by no means certain that sufficient surplus capacity will be available to supply auxiliary power to the Niagara System. As the Maitland River will be obliged to furnish power to the Niagara System during the Autumn and Winter months to compensate for power obtained from Niagara during the Summer, the serious nature of this condition is evident; for unless the Maitland River can furnish auxiliary power during the peak load period when it is required, the Summer power supplied by the Niagara System will have to be paid for by the County of Huron.

The projected scheme of development at the Black Hole involves the creation of an artificial head and also a diversion. It is proposed to build a dam of sufficient height to back the water up to Ben Millar bridge and to further increase the head by diverting the flow across the neck of a sharp bend in the river. The additional head obtained by this diversion will be 5 to 15 feet, depending upon the relative locations of the dam and power-house, and the total average head available would be about 80 feet.

The largest item of capital cost in connection with this development is the dam construction, and before the flow characteristics of the river had been investigated it was thought that earth fill construction could be used for the main dam, but the abnormal flood flow conditions evidenced by this Spring's measurements demonstrated the practical impossibility of utilizing this type of construction at the Black Hole. It was therefore necessary to largely increase such preliminary estimates as had been made to provide for a masonry dam, and the hollow reinforced type of construction was adopted as being the cheapest and most economical after giving proper consideration to safe and efficient handling of ice and flood-water.

In a general way it may be said that the conditions relative to development at the Black Hole could not well be more unfavorable, as the low water power conditions are such as to make the revenue-producing power capacities very small, while the flood conditions are such as to call for an abnormally heavy capital expenditure for dam construction and permanent works. The annual cost of generated power is therefore affected by reason of the fact that the revenue from power generated at low stages of flow must be sufficient to cover the heavy capital charges and maintenance costs arising out of the necessity for handling an abnormal flood discharge.

Two estimates of the cost of development at the Black Hole have been made, one for 2,000 h.p., and one for 6,000 h.p. installed capacity. The 2,000 h.p. estimate represents the cost of developing the Black Hole site, as an independent source of power, to the limit of dependable 10 hour capacity. The 6,000 h.p. estimate provides surplus installed capacity for the purpose of using the higher stages of flow to supply auxiliary power to the Niagara System.

The 2,000 h.p. estimate shows a capital cost of \$587,000, and a total annual charge of \$45,500. The 6,000 h.p. estimate shows a capital cost of \$637,000 and a total annual charge of \$51,500. Considering these figures in connection with the statements made above as to the effect of a low power capacity, combined with a heavy flood discharge, upon cost, it is interesting to note:

1. In the 2,000 h.p. estimate, the dam construction amounts to 63 per cent. of the total capital cost, and the annual charges against dam construction alone amount to 51 per cent. of the total annual charges.

2. In the 2,000 h.p. estimate, the interest and sinking-fund charges amount to 75 per cent. of the total annual charges.

3. In the 6,000 h.p. estimate, the dam construction amounts to 58 per cent. of the total capital cost, and the annual charges against dam construction alone amount to 45 per cent. of the total annual charges.

4. In the 6,000 h.p. estimate, the interest and sinking fund charges amount to 71 per cent. of the total annual charges.

It is evident from the above figures that the annual cost of generated power at the Black Hole will be high as long as the interest and sink-fund continues to be an annual liability, the more so because the revenue from such continuous power as can be generated under conditions of minimum flow will always have to carry the bulk of the annual charge against the development.

June 15, 1912.

REPORT NO. II

Round Lake Storage Dam

Instructions to Bidders.

1. Tenders will be received up to noon of Friday, November 17th, 1911, by the Hydro-Electric Power Commission of Ontario, for the construction of a storage Dam at the outlet of Round Lake, on Lot No. 8, Con. XIII., of the Township of Hagarty, County of Renfrew.

2. Tenders must be enclosed in a sealed envelope marked: "Tender on



Round Lake Dam, November Flood.

Round Lake Storage Dam," and addressed to the Honourable Adam Beck, Chairman, Hydro-Electric Power Commission of Ontario, Continental Life Building, Toronto.

3. Tenders must be submitted on the accompanying form of proposal. Any tenders submitted on other forms, or with additions, erasures, or alterations, may be rejected as informal.

4. Tenders must specify the shortest period of time within which the bidder will guarantee the completion of the work governed by the attached specifications.

5. Tenders must be accompanied by the attached specifications and drawings, all of which shall form a part of the contract to be entered into by the successful bidder.

6. Tenders must be accompanied by a certified check for \$500, which cheque will become forfeit to Commission as liquidated damages in the event of the successful bidder refusing or neglecting within two (2) weeks from the date of

mailing the notification to him from Commission so to do, to execute and deliver a satisfactory contract for the performance of the work governed by these specifications.

Checks of all bidders will be returned to them as soon as the contract shall have been executed.

The successful bidder shall execute a bond for \$1,500.00 for the proper performance of the work governed by the attached specifications.

7. Prices shall be written in words as well as figures.

8. The signatures of all parties tendering shall be in their respective handwriting.

9. Commission reserves the right to reject any or all tenders, and the lowest tender will not necessarily be accepted.

Toronto, Ontario, November 2nd, 1911.



Round Lake Dam, West Wing Wall.

Specifications and Conditions of Contract.

1. Nature and Location of Work:—The work governed by these specifications is located on Lot No. 8 of the 13th Concession of the Township of Hagarty in the County of Renfrew, and consists in the construction of concrete dam across the Bonnechere River for storage purposes, together with the supply of all necessary materials, plant, implements and labor necessary for or incidental to the building of such structure.

2. Meaning of Terms:—(a) The word "Commission" shall mean the Hydro-Electric Power Commission of Ontario.

(b) The work "Contractor" shall mean the party or parties to whom shall have been let the contract for the work to be done, and for the materials to be supplied under these specifications, or the legally appointed representatives, assigns and executors of said party or parties.

(c) The word "Engineer" shall mean the Chief Engineer of the Hydro-Electric Power Commission of Ontario, or the person from time to time duly authorized by the Commission to act in such capacity.

(d) The word "Work" or "Works" shall mean and include all the work to be executed, whether temporary or permanent.

(e) "The Contract" shall mean and include, along with the formal agreement, all specifications and plans further detailing, explaining or modifying the work, even though said plans and specifications be issued after the execution of the contract. It shall also be understood to include the Instructions of Bidders, General and Specific Conditions of Contract, Bidders' Proposal and Contractor's Bond.

(f) The word "Inspector" shall mean the person or persons duly authorized by the Engineer to inspect the work and materials under the Contract.

(g) The word "Plant" shall mean all the tools, horses, machinery, boilers, crushers, mixers, cars, tracks, and all temporary structures such as camps, store-houses, shoring, forms and profiles and all lumber, timber, derricks and whatever appliances or apparatus shall be brought to or constructed upon the site by Contractor for the performance of the work under the Contract.

3. Plans and Drawings:—Plan No. A-128 accompanies and forms part of these specifications. Contractor shall likewise be governed by any and all additional drawings which may be issued from time to time by Engineer, to supplement or supersede the drawing herewith attached.

Plans and specifications are intended to co-operate, so that if anything is shown upon the plans, but not mentioned in the specifications or *vice versa*, it is to be furnished and built as though specifically set forth in both. If any errors are discovered in the drawings, the same shall be referred to Engineer for adjustment before proceeding with the work.

4. Intent:—The nature and spirit of these specifications are to provide for the work herein enumerated to be fully completed in every detail for the purpose designed; and it is hereby understood that the Contractor in accepting the Contract, agrees to furnish any and everything necessary for such construction, notwithstanding any omission in the drawings or specifications.

Contractor shall apply to Engineer for any explanation which he may require in regard to the meaning and intent of any clause in these specifications and the Contractor shall be held responsible for any errors he may make in consequence of failure to obtain such explanation.

5. Scope of Work:—The work to be performed under these specifications comprises the construction of a concrete dam with three regulating sluices, a log-chute and spill-way with the necessary piers, abutments and wing-walls. Earth excavation will be required to place all portions of the structure on bed rock, and the rock excavation will comprise such stripping and trenching as may be necessary for a solid foundation and a proper bond between concrete and bed-rock. Back-filling will be required in the wing-wall trenches, and on the downstream side of the wing-walls.

6. Materials and labor:—Contractor shall furnish all materials and perform all labor to the extent that said labor and materials may be necessary for, or incidental to, the building to full completion of the work.

7. Transportation:—The railway shipping point available for the transportation of plant and material is Killaloe Station on the Ottawa-Parry Sound Branch of the Grand Trunk Railway. The distance from Killaloe Station to the site of the dam is approximately 6 miles, by a good road.

8. Accommodation:—If necessary, Contractor shall provide bunk-houses, eating camps, tents, etc., of sufficient capacity to house and feed his operating force in a comfortable and sanitary manner. If required, Contractor shall also provide free board and accommodation for Commission's Engineer or Inspector.

9. Inspection of Site and Plant:—Before tendering, Contractor or his accredited representative, shall make a careful examination of the site, and shall take cognizance of the nature and extent of the work to be performed, of the obstacles to be met with in its prosecution, and of any and all matters which may be necessary to form a proper conception of the conditions under which work will require to be performed.

10. Temporary Work and Unwatering:—During the entire time of executing the work governed by these specifications, Contractor shall, at his own cost, provide for the proper protection of same against water, whether from the stream or by surface wash. All deviating of such water and providing channels for conveying it away, together with construction of all necessary flumes, temporary dams, or coffer-dams for such above mentioned purposes shall be done by Contractor at his own expense; also such pumping, bailing and leakage disposal as is necessary to facilitate excavation and to lay concrete in accordance with the requirements of these specifications. Under these specifications the term "unwatering" shall include the removal of snow and ice.

11. Responsibility of Contractor:—Contractor shall be responsible, throughout the duration of the Work, for all violations on his part, or that of his employees, of any and all laws and ordinances (providing such violations occur on or near the site of work), and shall be responsible for all loss of life or injury to persons or property caused by the acts or omissions of himself or his employees.

Contractor shall properly protect all work and materials during construction and shall be responsible for the safety and efficiency of all false work and temporary structures, and for the condition of all permanent work, and shall make good any damage sustained to the same from the date of signing of Contract to date of formal acceptance of completed structure by Engineer.

Contractor shall be responsible for, and shall replace, at his own expense, any work improperly constructed through failure to apply to Engineer for enlightenment as to intent or interpretation of drawings or specifications.

Contractor shall be responsible for the preservation of all hubs, bench-marks, line stakes, etc., set or established by Engineer. Any errors entering into work through failure of Contractor to notify Engineer concerning destruction or misplacement of such stakes, marks, etc., shall be made good at Contractor's own expense.

Contractor shall be responsible for the water tightness of all concrete masonry, including contact with bed-rock.

12. Methods of Procedure:—As far as is consistent with the interests of the work and the results to be attained, the order and methods of presecuting said work will be left to the discretion of Contractor, with whom the responsibility of such order and methods shall rest. Provided, however, that Engineer shall at all times have the right to prescribe and control such order and methods with a view to the safety, rapidity and economy of construction of said work. In this connection, Contractor shall note the importance of so ordering his work as to provide, if required, a continuous and adequate outflow from the lake for power purposes on the lower river.

13. Alterations, Omissions and Extra Work:—The Engineer shall have the power to vary, extend, increase or diminish the quantity of the work or to dispense

with any portion thereof during its progress without impairing Contract, and no compensation shall be due Contractor except for the work actually done, such compensation being based on prices submitted in his proposal.

In case any change involves the execution of work of a class not herein provided for, Contractor shall perform the same and shall be paid the actual cost thereof, plus the percentage of profit to be hereafter agreed upon. In this case Contractor shall furnish Engineer with satisfactory vouchers, certificates, etc., for all labor and material expended on such work.

Contractor shall perform the work entailed by such additions, omissions and alterations only upon the receipt of Engineer's order therefor in writing, and any and all such extra work shall be performed strictly in accordance with these specifications in so far as they are applicable.

Engineer, at his discretion, may grant Contractor such extension of time as seems to him proper for the completion of any work which may reasonably be considered an addition to the original amount tendered upon.

14. Inspection:—All work and material shall at all times be subject to inspection by Engineer or his regularly appointed Inspector, who shall at all times be allowed every facility for examining said work and material.

All material condemned by Engineer or Inspector as unfit for the purpose for which it is intended, or as not fulfilling these specifications, shall be immediately removed from the works.

All work condemned by Engineer or Inspector shall be removed and rebuilt, free of charge to Commission, in a satisfactory manner, as governed by these specifications, and all work disturbed in the course of removal of said condemned work shall be made good, at Contractor's own proper cost and expense. Contractor shall be liable for replacement of defective work up to the time of final acceptance by Engineer of all work to be done under Contract.

In case Engineer or Inspector observes improper workmanship or procedure, or the use of defective material, in course of the construction, he will call the same to the attention of Contractor, or the foreman in immediate charge of that portion of the work, but should such foreman be inaccessible at the time, Inspector shall order the workmen to remove such improper work or materials, and his orders shall be immediately obeyed by such workmen.

15. Employees:—Any workman or mechanic employed upon the work governed by these specifications, who shall be deemed by Engineer or Inspector to be incompetent or disorderly, shall, on proper representation to Contractor, be by him discharged from the work, and shall not at any time thereafter be re-employed upon the same.

16. Labor, Plant and Materials:—Should Engineer be of the opinion, and so state in writing to Contractor that the force of men, or the quantity of plant supplied for the performance of the work governed by these specifications, is not sufficient or that the character of said plant is not suitable, or that the methods employed are not such as will indicate that the work will be completed within the time mentioned in Contractor's Proposal, Contractor shall forthwith increase the number of men employed upon the work under Contract and shall make the required additions to his Plant and shall conform to the method of procedure desired by Engineer. Should Engineer be of the opinion and so state in writing to Contractor, that materials for the work under Contract are not arriving at such a rate, or within such a time as to indicate that the entire work will be completed within the time mentioned in Contractor's Proposal, Contractor shall forthwith proceed to obtain such material at the rate or within the time directed by Engineer.

In the event of Contractor failing to meet the requirements of Engineer in the matter of Labor, Plant or Material as above, Commission shall be empowered to employ such additional labor, obtain such material and such additional plant, and deduct all costs in connection therewith from any moneys then due or to become due to Contractor.

17. Authority:—There shall be continuously on duty at the Works, during working hours, a duly appointed representative of Contractor, in whom, as Superintendent, shall be vested the necessary authority to supervise the carrying out of the work under the Contract and who shall be authorized and prepared to receive from time to time, as for Contractor, orders and instructions from Engineer. Superintendent, as an employee of Contractor, shall be subject to conditions of Section 15 of these specifications.

There will be continuously on duty at the works a duly appointed representative of Engineer in whom will be vested all Engineer's authority as governed by these specifications.

18. Engineer's Decision:—Engineer's decision shall control as to the interpretation of drawings and specifications during the execution of the Work, and he shall be sole judge of work and material, both as to quality and quantity, and his decision on all questions of dispute with regard to work or material shall be final.

19. Lines and Grades:—All lines, grades, elevations and profiles will be set or established by Engineer, and Contractor shall furnish free of cost any labor which may be necessary or convenient, and shall facilitate in every way all operations incidental to or necessary for the setting of such stakes, profiles, etc.

20. Sub-Contracts:—No part of the work is to be sub-let, unless by written consent of Engineer; Contractor stating in writing to Engineer the name of the sub-contractor to whom he purposes to let a portion of the work. Any and all such sub-contractors will be regarded as employees of Contractor and shall be answerable to all clauses in these specifications referring to such employees.

21. Suspension and Extension of Time:—Commission shall have the right to suspend operations from time to time at any point, or upon the whole of the works. In the event of such right being exercised, so as to cause any delay to Contractor, then an extension of time equal to such delay, and to be fixed by Engineer, shall be allowed for completion of Contract, and Commission shall pay Contractor all reasonable expenses arising from such suspension of work, unless it be due to purely natural causes, or to some default on the part of Contractor.

No such suspension or extension shall violate this Contract or any portion thereof, or release Contractor or others from any obligation hereby imposed, or bond, or surety for the performance of this Contract.

Contractor shall furnish Engineer with proper vouchers, certificates, etc., for all items upon which claim is made under this clause, and shall also immediately resume operations upon receiving written instructions from Engineer so to do.

22. Liquidated Damages:—For each day of delay beyond the date set in Contract for completion of work governed by these specifications or beyond the date set in the written notification of Engineer regarding extension of time, Commission shall withhold permanently from Contractor's total compensation the sum of \$10.00 (Ten dollars).

The amounts thus withheld shall not be considered as a penalty, but as liquidated damages fixed and agreed to by the contracting parties.

23. Estimates and Payments:—On or about the end of each month a progress estimate will be prepared by Engineer showing approximately the amount of each

class of work performed during that month, and the value thereof will be computed as per schedule of prices incorporated in Contract. Ninety (90%) per cent. of the amount of each estimate thus prepared will be paid to Contractor in cash, on or about the fifteenth of the month following.

Upon completion of work, Engineer will make a completely revised estimate of the total quantity of the various classes of work performed, based on field measurement and valued as per schedule of Contract prices. The amount of this final estimate, less the total amount of all moneys advanced on progress estimates, shall become due to Contractor within thirty days of, and subsequent to, Engineer's formal acceptance of all work performed under this Contract. At the same time shall become due, and under the same conditions, all remuneration to which Contractor is entitled for the performance of work of a class not mentioned in the Schedule, as per clause 13 of these specifications.

24. Liens:—Before Contractor receives final payment from Commission for completed work, he shall show satisfactory evidence that all just liens, claims and demands of his employees, or of parties from whom materials or plant used in construction may have been purchased or procured, have been fully satisfied, and that the materials furnished and work done in the performance of completed Contract are fully released from all such liens, claims and demands.

If during the progress of the work, it appears that Contractor's bills for labor and material are not being paid, Commission shall have the right to withhold from Contractor's monthly payments a sufficient sum or sums to guarantee itself against all losses from mechanics' and other possible liens, and to supply the said sum or sums to the payment of such debts.

25. Definitions:—(a) "Rock" shall mean all solid rock, rock in ledges and all detached masses more than one-third (1-3) cubic yard in volume.

(b) "Earth" shall mean all other material than "Rock" (except snow and ice) including sand, gravel, clay, peat, mould, and detached masses of rock or boulders less than one-third (1-3) cubic yard in volume.

26. Timber and Lumber:—All timber and lumber used for forms and false work shall be properly seasoned and sound, and such as will, in Engineer's opinion, be safe and suitable for the conditions under which it is to be used.

27. Forms:—All plank used for lagging shall be out of wind, dressed on one face, and dressed true and parallel on the edges. Forms shall be externally braced and stayed in such a way as to withstand ramming without bulging or spreading. Lagging shall butt and match so as to hold a good wet mixture without undue leakage.

28. Cement:—None but approved and well-known brands of Portland cement shall be used on the work, and same shall be stored in a tight shed with a close floor set up at least one foot from the ground. Engineer may make such tests as he considers necessary, and all condemned cement shall be immediately removed from the work. Cement will be judged, not only from Engineer's tests, but also by its behavior in the work.

29. Sand:—All sand used shall be coarse, clean and sharp and free from loam, clay or mould. If necessary in opinion of Engineer, all sand shall be washed.

30. Broken Stone:—All broken stone shall be clean and free from clay, or loam. The run of the crusher may be used throughout with the exception of such sizes as will not pass through a two and one-half ($2\frac{1}{2}$) inch ring. Rock excavated on the site may be used subject to written approval of Engineer.

31. Gravel:—If gravel is obtainable, of quality approved by Engineer, it may be used in proportions as below specified for broken stone, gravel being screened to obtain such proportions, if necessary.

32. Concrete:—Concrete used shall consist of two mixtures as follows:

(1) One (1) part cement. Two (2) parts sand. Four (4) parts broken stone.

(2) One (1) part cement. Three (3) parts sand. Six (6) parts broken stone.

In mixing, one barrel of cement shall be considered to contain 3.5 cubic feet, and one barrel of cement to contain 4 bags.

Concrete 1-2-4 shall be used in the following locations:—

(1) On the pier noses and up-stream faces of abutments for a distance approximately two (2) feet back from the face.

(2) In the sluice aprons.

(3) For a distance of two (2) feet above the level of the aprons on all piers and abutments.

(4) To a depth of twelve (12) inches on the crest of the spillway.

Small quantities of 1-2-4 concrete may also be required in various locations, as Engineer directs.

Concrete 1-3-6 shall be used in such positions in the piers and abutments as are not specified above for 1-2-4 concrete, and also in the wing-walls and spill-way.

Small quantities of 1-3-6 concrete may also be required in various locations, as Engineer directs.

Should unforeseen conditions make the use of the above mixtures unsuitable or unsafe, Engineer shall have the privilege of altering the proportions of cement, sand and stone, to make a more suitable mixture, and a price for the new mixture shall be agreed upon by Engineer and Contractor.

The method of mixing concrete shall be left to Contractor, but shall preferably be mixed with a power driven rotary mixer, no gravity mixer being allowed. Should Contractor decide to mix all or any large proportion of concrete by hand, the method of so doing will be prescribed in writing by Engineer.

Concrete shall be deposited in layers not more than nine inches thick, and shall be rammed till puddles form on the surface. The 1-2-4 facing mixture on the pier noses shall be laid up simultaneously with the 1-3-6 backing and rammed with it, ramming from the forms in towards the heart of the wall. Concrete shall be spaded on all faces to insure smooth surface.

When fresh concrete is to be laid upon the surface of concrete already set or upon original or excavated rock surface, such surface shall be washed and thoroughly cleaned with water and brushed over with a grout of neat cement immediately before the fresh concrete is laid.

All cement must be placed immediately after mixing. No re-tempering will be allowed.

In portions of the structures which are more than four feet in thickness the use of "plums" is permissible. Such "plums" shall consist of clean, sharp-edged, irregular fragments of wet rock, which shall be driven solidly into the wet concrete. There shall be at least six inches of concrete between stones so placed, and between stones and forms. These stones shall also serve as keys to bond together batches of concrete placed on consecutive days, and for this purpose shall project approximately half their longest dimensions from the surrounding concrete. No stone containing more than two cubic feet shall be used in the above manner.

Contractor shall take such means as Engineer may direct to protect concrete from frost. Any suspension of work in connection with the placing of concrete,

ordered by Engineer on account of extreme weather, shall not constitute a claim for compensation under Clause No. 21 of these specifications.

Concrete shall in all cases be laid in the dry and not under water.
No forms shall be removed from concrete except at direction of Engineer.
All finished concrete shall conform to the lines laid down in the drawings, and the final and progress estimates shall be based on these lines.

33. Earth Excavation:—Earth excavation shall be defined as per Clause No. 25.

Earth shall be removed according to lines established by Engineer as work progresses, and no allowance shall be made for excavation or falls outside of these lines.

34. Rock Excavation:—Rock, defined as per Clause No. 25, shall be taken out, in trenches and other excavation, to lines established by Engineer as work progresses, and no allowance shall be made for excavation or falls outside these lines. All bed-rock upon which the dams are founded shall be trenched.

35. Back-filling:—The up-stream wing-wall trenches shall be back-filled with selected filling as noted on plan. All back-filling shall be thoroughly tamped or otherwise compacted to the satisfaction of Engineer.

36. Structural Steel and Wrought Iron.—Structural steel will be required for stop-log grooves, and a small amount of wrought iron will be required for the stop-logs. All material supplied under this head must be of good quality and subject to the Engineer's inspection and acceptance.

Steel for stop-log grooves shall be set in the concrete forms to lines established by Engineer.

37. Stop-logs.—Stop-logs shall be clear yellow pine, or B.C. fir, well seasoned and dressed, straight and true. Sills shall be of the same quality of timber and shall be set accurately to line and grade as shown in the drawing.

38. Flooring.—The floor of stop-log platform shall consist of undressed well-seasoned hemlock plank and shall be spiked or laid loose as Engineer directs.

39. Cofferdams.—The location of coffer-dams, and the method of constructing same shall be left entirely to Contractor, the only limitation being that such structures shall keep the site of work free of water, either with or without the necessity for pumping, bailing or other method or methods of leakage disposal.

40. Schedule of Quantities.—The following is a summary of estimated quantities of work and material governed by these specifications, it being understood that the quantities given herein are merely approximate and subject to change.

Earth excavation	550 cubic yards.
Rock excavation	75 " "
Concrete	450 " "
Back-filling	350 " "
Wrought iron and steel furnished and placed	2,250 pounds.
Lumber and timber for flooring	2,500 feet B.M.
Stop-logs furnished and framed	8,850 " "
Sluiceway sills furnished and placed	1,200 " "

Proposal.

THE HONOURABLE ADAM BECK, Toronto, Ontario,

DEAR SIR,—

The undersigned having inspected the locality where the work hereinafter mentioned is to be performed, and having examined the plans and specifications governing said work, do now propose to provide all tools and appliances necessary for the proper prosecution of the work, and to furnish all material, and to perform all labor necessary for or incidental to the construction of the dam, in accordance with the plans, specifications and contract governing this work, and to carry the work to a full completion to the satisfaction of your Engineer, at the following prices, viz.:

1. For excavation of earth, including all solid material (except snow and ice, and such as is herein classified as rock) together with its removal and disposition, the sum of 65 cents (sixty-five cents) per cubic yard.

2. For excavation and removal of rock, the sum of \$2.25 (two dollars and twenty-five cents) per cubic yard.

3. For concrete in place, the sum of \$8.50 (eight dollars and fifty cents) per cubic yard.

4. For back-filling, the sum of 30 cents (thirty cents) per cubic yard.

5. For structural steel and wrought iron furnished and placed, the sum of 6 cents (six cents) per pound.

6. For lumber and timber furnished and placed in floor of dam, the sum of \$30.00 (thirty dollars) per M. feet B.M.

7. For stop-logs and sills, furnished, framed and placed, the sum of \$50.00 (fifty dollars) per M. feet B.M.

The following is a summary of our proposal, the quantities used being those given in your Engineer's schedule, it being understood that the quantities given therein are merely approximate and subject to change:—

550 cubic yards excavation of earth at 65c.	\$357 50
75 cubic yards excavation of rock at \$2.25	168 75
450 cubic yards concrete at \$8.50	3,825 00
350 cubic yards back-filling at 30c.	105 00
2,250 lbs. steel and wrought iron, furnished and placed at 6c.	135 00
2,500 ft. B.M. lumber and timber for floor of dam at \$30.00	75 00
10,050 ft. B.M. stop-logs and sills, furnished, framed and placed at \$50.00....	502 50
	<hr/>
	\$5,168 75

If this proposal be accepted, we agree to enter into and execute a contract governing this work. We also agree to commence work within ten days from date of signing of said contract and to complete all of said work, in accordance with plans and specifications on or before the 15th of February, 1912.

Yours very truly,

(Signed) MCCOY and MAGUIRE,
Contractors.

Dated at Trenton, Ont., Nov. 16, 1911.

Contract.

THIS AGREEMENT, dated the 20th day of May, 1912,

Between

CHARLES DANIEL MAGUIRE, herein called the Contractor, the First Party,

and

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO, herein called the Commission, the Second Party.

WITNESSETH:

That the parties covenant, promise and agree each with the other as follows:

1. The Specifications for the construction of the storage dam at Round Lake, the instructions to bidders, Plan A-128 showing details of construction of storage dam at Round Lake, and Contractor's proposal shall all be attached hereto, and shall form part of this Contract, the meaning of the term "Contract" to be defined as per Clause 2-e of the attached specifications.

2. The Contractor agrees:—

(a) To construct and erect the storage dam complete and to supply all labor, plant and materials necessary in connection therewith.

(b) To use the best material and carry the work to completion in a thorough workmanlike manner in strict conformity with said plan, specifications, and all additional plans which may be issued under the conditions of Clause No. 3 of said Specifications.

(c) That the signing of the contract by the parties hereto shall constitute an order from Commission to Contractor to proceed with the work under contract without further delay.

(d) Subject to receiving notice as above specified, to fully complete the work under contract to the satisfaction of the Commission on or before the 15th day of September, A.D. 1912.

(e) To execute a bond satisfactory to the Commission in the sum of One Thousand Five Hundred Dollars (\$1,500.00) for the proper performance of work under contract.

3. The Commission agrees:—

(a) To pay Contractor for the different classes of work in accordance with the conditions of Clauses Nos. 13 and 23 in the attached specifications.

(b) To provide free access to the property upon which the storage dam is to be built.

4. It is further agreed:—

(a) That the grouting of bed-rock before laying concrete shall include the grouting of such fissures or cracks as, in the opinion of the Engineer, will require such treatment to insure water tightness as called for in Clause No. 11 of attached specifications.

(b) That progress and final estimates of quantities of earth and rock excavation shall be based on measurement of material in place before removal, and that progress and final estimates of quantities of back-filling shall be based on measurement of same after having been placed in accordance with the requirements of attached specifications.

(c) That any extra work as defined by Clause No. 13 of attached specifications, performed or executed by Contractor without the required written order

from Engineer, shall be performed or executed entirely at Contractor's risk, and it shall rest with the Engineer to decide whether or not Contractor shall receive compensation therefor.

(d) That Contractor shall signify his acceptance of all progress estimates and of the final estimate, by signing the same with Engineer before they are presented to the Commission for payment.

(e) That Contractor, upon completion of the work, and before the final payment is made, will remove from the site of the dam all plant, debris, refuse, material, temporary sheds, buildings, etc., and dispose of all unused excavated material in orderly piles so situated as not to interfere with the operation of the dam, or with the proper disposal of flood-water.

(f) If, within twelve months from the date of the final certificate of the Engineer, it appears that unsound or defective material supplied by Contractor has been used, or the work under contract has not been executed in a substantial, workmanlike and proper manner, the Contractor shall be liable to the Commission for all damages arising therefrom. No certificate, payment, or other act, matter or thing, done or omitted under this contract shall bar or prejudice the rights of the Commission.

(g) If any difference shall arise during the progress or after the completion of the works, as to any matter or thing arising under or out of this contract, such difference shall be referred to two arbitrators, one to be chosen by each of the parties hereto, and they shall choose a third arbitrator, but if they cannot agree, such third arbitrator shall be chosen by the Chief Justice at the time of the King's Bench Division of the High Court of Justice. When possible, the arbitrators shall decide such difference in a summary manner. Either party may appeal from any award of the arbitrators, as provided by the Arbitration Act, Ontario Statute, 1909, but no such appeal shall be carried beyond the decision of the Court of Appeal of Ontario. The Arbitrators shall not consider any matter of difference which is expressly or by implication required or permitted to be decided by the Engineer, or as to the grounds upon which, or mode in which, any opinion may have been formed or discretion exercised by the Engineer.

(h) For all purposes of this contract, notices shall be served upon the Engineer, or his appointee, in writing, for the Commission, and upon the Manager, or his appointee, in writing, for the Contractor.

(k) Time shall be of the essence of this agreement.

(l) This agreement shall extend to, be binding upon and enure to the benefit of the executors, administrators and assigns of the first party, and of the successors and assigns of the second party.

IN WITNESS WHEREOF the said Commission has affixed its corporate seal and has signed, sealed and executed the present agreement; and Charles Daniel Maguire has signed, sealed and executed the present agreement on behalf of Contractor.

WITNESS:

As to signatures of Commissioners,

W. W. POPE.

(Signed) A. BECK,
Chairman.

(Signed) JOHN M. HENDRY,
Commissioner.

(Signed) C. D. MAGUIRE,
Contractor.

As to signature of Contractor,

(Signed) W. S. McNAMARA.

REPORT No. III

North Bay

Attached hereto is a revised estimate of the capital cost and annual charges in connection with supplying power to the Municipality of North Bay from Smoky Falls, prepared in accordance with the recent request of the Municipality. This estimated is a complete revision of the one which was submitted to the Municipality in August, 1908.

In the attached estimate, it has been considered advisable to include the cost of permanent power-house and sub-station buildings in place of the temporary superstructures originally estimated upon. The transmission line has also been built for full capacity at the outset instead of erecting one circuit for half capacity as in the original estimate. The transmission route has also been increased three miles, by bringing the line by the shortest route down to the main line of the C.P.R. instead of carrying it straight across country. The effect of these changes has been to make a slight decrease in the capital cost for full capacity, and a considerable increase in the capital cost for half capacity. The result of installing transmission line for full capacity at the outset has been to make a slight reduction in the annual charge of power for full capacity, and a slight increase in the annual cost of power for half capacity.

Estimate for full capacity of 2,500 h.p. delivered in North Bay, at 2,200 volts.

Capital Cost:

Dam, Power House and Permanent Works	\$48,700 00
Generating Equipment	67,000 00
Transformation	66,230 00
Transmission	51,740 00
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	\$233,670 00
Engineering and Contingencies, 10%	23,367 00
Interest during Construction, 3%	7,010 00
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Total Capital Cost	\$264,047 00

Capital Cost on basis of 2,500 h.p. delivered, \$106.00 per h.p.

Annual Cost:

Dam, Power House and Permanent Works	\$540 00
Generating Equipment	3,323 00
Transformation	3,294 00
Transmission	2,870 00
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Total Maintenance and Depreciation	\$10,027 00
Annual Interest, 5% on \$264,047	13,202 00
Sinking Fund, 1.8% on \$264,047	4,753 00
Operation and Administration	7,000 00
Engineering and Contingencies	1,300 00
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Total Annual Cost	\$36,282 00

Annual Cost on basis of 2,500 h.p. delivered, \$14.50 per h.p.

Estimate for half capacity of 1,250 h.p. delivered in North Bay, at 2,200 volts.

Capital Cost:	
Dam, Power House and Permanent Works	\$43,900 00
Generating Equipment	37,550 00
Transformation	46,290 00
Transmission	51,740 00
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	\$178,480 00
Engineering and Contingencies, 10%	17,848 00
Interest during Construction, 3%	5,354 00
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Total Capital Cost	\$201,682 00
Capital Cost on basis of 1,250 h.p. delivered, \$161.00 per h.p.	

Annual Cost:	
Dam, Power House and Permanent Works	\$492 00
Generating Equipment	1,788 00
Transformation	2,104 00
Transmission	2,870 00
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Total Maintenance and Depreciation	\$7,254 00
Annual Interest, 5% on \$201,682.00	10,084 00
Sinking Fund, 1.8% on \$201,682.00	3,630 00
Operation and Administration	5,400 00
Engineering and Contingencies	940 00
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Total Annual Cost	\$27,308 00
Annual Cost on basis of 1,250 h.p. delivered, \$21.80 per h.p.	
December 14, 1911. .	

REPORT NO. IV

Wingham

Under date of Nov. 12, 1910, a resolution of the Council of the Town of Wingham was forwarded to the Commission, asking to have a certain power site on the Maitland River examined with a view to reporting on the probable power capacity and the cost of development.

The site of the development, which is located on Lot No. 32 of the 13th Concession of East Wawanosh, about $6\frac{1}{4}$ miles from the Town of Wingham, has no natural advantages of any kind. There is no natural head, all dam construction must be founded on material other than rock, and the flow characteristics of the stream vary to such an extent that at low water the power capacity is very limited, while at high water there is every probability that the head reduction will be such as to seriously affect the operation of the turbine wheels.

An examination of the site disclosed the fact that a detailed survey would be necessary in order to determine the possible head, and to ascertain the extent of back-water. This survey indicated that a 15-foot head at the site of development would involve land damages to the extent of about 150 acres and would back up the water about $4\frac{1}{4}$ miles. A plan of this survey was forwarded to the Municipality under date May 12, 1911, with a letter stating that no further report would be forthcoming until some definite information had been procured in connection with the flow characteristics of the stream.

Beginning with June 17, 1911, monthly measurements of flow have been made up to the present date, the last gauging having been made on Dec. 21st, 1911. The results of these measurements are tabulated hereunder, giving the power capacity under a 15-foot head for the various observed stages of flow:—

Date of Measurement	Discharge.	24 hr. Power Capacity.
June 17, 1911	218 sec. ft.	270 h.p.
July 17, "	139 " "	174 "
Aug. 12, "	86 " "	108 "
Sept. 19, "	81 " "	102 "
Oct. 14, "	166 " "	210 "
Nov. 19, "	2,446 " "	3,000 "
Dec. 21, "	920 " "	1,150 "

The above figures indicate that during the past summer the period of minimum flow occurred during the months of August and September, and it is to be noted that the flow measurements made during these months do not indicate the extreme minimum discharge. This is proved by the fact that measurements taken at Goderich on the same date did not indicate minimum flow, as the gauge at Ben Millar registered lower stages both before and after the dates of the August and September gaugings. In view of this, it would not be safe to assume the minimum flow at Wingham at anything higher than 70 second feet for the past summer. This is equivalent to a 24-hour power capacity of 90 h.p.

On the basis of the above figures, if it is assumed that minimum flow conditions obtain during the summer and not during the winter, the continuous annual capacity of the site would be about 100 h.p. for 24 hour power, and from 150 to 200 h.p. for 10 hour power, depending on the character of the load.

As above mentioned, there is no natural head available, so that the operating head, which is taken at 15 feet, will require to be created wholly by means of a dam. The estimated cost of a plant of 200 h.p. installed capacity operating under this head totals \$96,000, and the total estimated annual charge is \$10,500, which makes the annual cost of power \$105 per h.p. on a continuous 24 hour basis, or \$70 per h.p. per annum on a 10 hour basis.

Owing to the unfavourable character of the bottom at the site of development, the main items of cost in the above estimate are the dam, power-house, and excavation and unwatering. These items alone total \$50,000 and are the **variable and uncertain** items in the estimate. Even assuming, however, that this portion of the work only costs half of the above sum or \$25,000, the total capital investment and annual charge would still be sufficient to make the cost about \$97 per h.p. per annum on a 24 hour basis, and \$58 per h.p. on a 10 hour basis.

It is to be noted that these figures do not include the cost of local distribution, but only the cost of delivering power at 2,200 volts in the municipal sub-station. The delivery of this power to the individual customer would necessitate a further capital outlay and a consequent increase of the annual cost of power.

It would seem, therefore, in view of the above facts, that the development of this site to the extent necessary for the requirements of the Town of Wingham is not commercially feasible. This site might be developed for a capacity of 50 to 200 h.p. by means of a cheap wooden dam controlling a head of about 10 feet and the hydraulic power used direct by some industry which would not suffer serious inconvenience from lack of power at low stages of flow. Apart from this possibility the site has no economic value as a source of power.

January 2, 1912.

REPORT NO. V

Parry Sound

The Seguin River, within the limits of its capacity, provides the most economical source of hydraulic power available to the Town of Parry Sound, which is located at its mouth. The watershed of the river, about 400 square miles in extent, contains a large number of lakes, and it is proposed to investigate the possibility of utilizing the storage capacity of these lakes to augment the low water flow.

Investigation of precipitation records from Parry Sound, Uplands and Emsdale indicate that the minimum annual precipitation on the Seguin watershed up to the end of 1911 is 28.95 inches. Assuming that the run-off is 33 1-3 per cent. of the total precipitation, there would be 9.65 inches of rain available for power purposes in a minimum year. The geological and topographical features of the watershed are such that this estimate of available run-off is believed to be conservative.

A run-off of 9.65 inches from a watershed of 400 square miles would mean a total discharge of 9,347 million cubic feet per annum. If the total run-off were conserved, this would produce a continuous uniform discharge of 300 sec. feet, or 25 continuous 24 hour electric horse-power per foot of head at Parry Sound. This figure represents the maximum possible continuous capacity obtainable from the Seguin River, and it remains to ascertain how far the construction of storage works will go towards the realization of this maximum condition.

The principal lakes of the Seguin watershed are listed hereunder, the area of each being shown, also the area of the tributary watershed and the probable storage draft which would be available on each lake.

Lake.	Lake Area, acres.	Watershed Area, sq. miles.	Storage Draft, feet.	Storage Capacity, million cubic feet.	Total Run-off, million cubic feet.	Surplus Run-off, million cubic feet.
Whitefish	978	10	5	213	224	11
Turtle	294	17	5	64	381	104
Star	355	29	9	139	650	234
Marsh	122	36	5	27	807	364
Maple	495	61	5	108	1,367	816
Duck	176	64	5	38	1,435	846
Isabella	381	169	10	166	3,788	3,033
Manitowabin	1,751	142	8	610	3,182	573
Lorimer	1,027	13	6	268	291	23
Harris	427	25	6	112	560	180
Bell's Lake	162	32	5	35	717	302
Long	551	13	8	192	291	99
Trout	598	4	3.5	90	90	.....
Mill	1,191	417	12	623	9,347	6,662
Totals .....	.....	417	.....	2,685	9,347	6,662

It is to be noted in the above table that the areas of the various lakes have been taken off township maps, so that their actual storage capacity should in many cases be greater than the figures indicate. Also Horn Lake and the "1,000 Acre Meadow" have been omitted as they could not be located on the township maps.

If these two basins were substituted for some of the smaller lakes included above, such as Marsh, Duck and Bell's Lake, the total volume of storage would be increased and one dam eliminated. All conclusions drawn from the above figures should therefore be on the safe side.

These figures indicate that the aggregate storage capacity of the lakes considered is about 2,685 million cubic feet, and the non-regulated surplus run-off below Mill Lake is about 6,662 million cubic feet per annum. The above storage capacity would produce a continuous discharge of:—

207 sec. feet for 5 months in each year, or

173 sec. feet for 6 months in each year, or

148 sec. feet for 7 months in each year.

The distribution of flow due to the non-regulated surplus can only be determined by actual operating experience, but while it is impossible for this reason to assign a definite value for the minimum non-regulated discharge, it might be safely estimated at not less than 173 sec. feet, which would mean that a continuous discharge of 173 sec. feet would be available the year round by drawing on storage for six months.

A discharge of 173 sec. feet would produce 14.5 continuous electric horsepower per foot of head. This would make the normal 24 hour capacity of the Municipal Plant about 360 h.p. With the night storage and load factor accommodation afforded by Mill Lake, 700 h.p. of installed capacity in the Town plant would seem to be quite justifiable. It is reported that a 25 foot head is available at Mountain Rapids above Mill Lake. As practically the same amount of water is available at both sites, the combined 24 hour capacity of both plants would be approximately 756 e.h.p. The Mountain Rapids' plant would be deficient in 10 hour capacity, owing to lack of pondage, but the two plants operating together should be able to handle a 10 hour switchboard load of 1,000 to 1,200 h.p. and a connected load of 1,800 h.p.

Sufficient data is not at present available to lay out a definite scheme of development or to make estimates of cost, but the first step would doubtless be to rebuild the dam at Mill Lake, as this dam would be the central control point for the whole storage system. With a tight and properly designed dam at Mill Lake, it might not be necessary to go to any further expense for some time, other than putting comparatively inexpensive repairs on the present lumbermen's dams on the Upper Lakes. These upper dams need not necessarily be tight, as leakage could be held and controlled at Mill Lake.

April 13, 1912.

REPORT NO. VI

Parry Sound

A reconnaissance survey of the Seguin River watershed was made in the month of June 1912. This survey indicated the existence of certain conditions which may be summarized as follows:

1. The area of the watershed is only 365 square miles instead of 400 square miles, as estimated in the report of April 13, 1912.

2. The continued filling of certain storage basins in the upper watershed indicated that the annual run-off might be somewhat in excess of the 9.65 inches estimated in the report of April 13th, 1912. In the case of Whitefish and Clear Lakes, such local information as was obtainable indicated that these lakes were filled regularly from year to year to the limit of their storage capacity. To accomplish this would require a run-off of about 15 inches from the tributary watershed. If an average minimum run-off of 12 inches for the whole watershed is assumed, the resultant volume of annual run-off will be greater than that estimated upon in the report of April 13, 1912, notwithstanding the fact that the area of the watershed has been found to be less.

3. The actual storage areas of many of the lakes is considerably greater than the areas used in the report of April 13, 1912, which were taken from old township maps.

4. Most of the dams now in existence throughout the watershed are so located and in such condition that a reasonable sum expended in repairs would enable them to render effective service as storage dams.

5. The foundation material is rock in nearly every instance and new dams could be built where necessary at reasonable cost.

In view of the above, the following conclusions seem justifiable:

(1) That a larger volume of annual run-off will be available than was previously estimated upon.

(2) That greater storage capacity exists in the various lakes than has been estimated upon, and consequently there exist greater possibilities as regards the ultimate volume of regulated flow.

The final conclusion is, therefore, that if there exists a *bona fide* demand for power in Parry Sound in excess of the present capacity of the Municipal plant, the additional demand can be most economically met by the development of storage.

At the present time it is impossible, and also unnecessary, to lay out any scheme which would embrace the complete development of storage in the Seguin watershed. The development of any storage scheme should begin at some point where the advantage to be gained is obvious and certain, and the records and results derived from such preliminary development used as a guide for the gradual extension of the system.

As regards the Seguin watershed, obvious advantage is to be derived from the proper control and regulation of Mill Lake and Manitowabin Lake, and the successive steps to be undertaken for complete development would be somewhat as follows:

First.—The development of the Mill Lake storage.

Second.—The development of the Manitowabin Lake storage.

Third.—The development of the Isabella Lake storage.

Fourth.—The development of the Duck, Maple and Marsh Lake storage.

Fifth.—The development of the Whitefish and Clear Lake storage.

Sixth.—The development of the Lorimer and Upper Owl Lake storage.

Seventh.—The development of the Long Lake storage.

Eighth.—Finally, if future investigation proves that more perfect regulation of flow could be obtained at economical cost for dam construction and land damages, the development of the smaller basins, such as Horn Lake, Harris Lake, 1,000 Acre Meadow, etc., could be considered.

In view of existing conditions, therefore, it is probable that the consideration of immediate development may be limited to Mill Lake and Manitowabin Lake. The tightening up and general repair of the dam seems to be all that is necessary at present as regards Manitowabin Lake, while the Mill Lake storage will require to be controlled by a masonry dam so designed as to reduce leakage to a minimum, and afford the best facilities for the rapid and efficient handling of water.

The waters of Mill Lake may be controlled either by building on the site occupied by the present wooden dam, or by raising the dam and head works at the Municipal plant sufficiently to drown out the present Mill Lake dam. This matter requires careful consideration, as the advantage does not lie altogether with either site.

The advantages and disadvantages of the two sites may be summarized as follows:—

1. The upper site would make 10 to 13 feet of storage available on Mill Lake.

The lower site would make not more than 5 feet of storage available, as any greater variation in the elevation of head-water would injuriously affect the regulation of the wheels. This disadvantage could be overcome by controlling the elevation of tail-water.

2. The topographical features of the upper site are such that the length of dam necessary for closure is considerably greater than is necessary for spillway and sluice capacity to handle flood water.

At the lower site the dam would require to have greater height but would be shorter, and the greater part of its length could be utilized for sluice and spillway construction.

3. A 10 foot variation of level on Mill Lake would interfere seriously with navigation. A 5 foot variation might possibly allow permanent navigation as far up the river as Mountain Rapids. This would be an important consideration in the event of the development of power at that point.

4. The building of a dam at the upper site would entail an annual liability for operation, maintenance and depreciation on two separate dams. These charges would apply to one structure only in the case of the lower site.

5. No land damages would be involved in the case of the upper site. If the lower site were used, flood privileges would require to be purchased from the headworks of the Municipal plant up to the present Mill Lake dam.

6. If the level of head-water could be raised 8 feet, there would be 3 feet of extra head on the Municipal plant after allowing for 5 feet of storage. This would mean about 12 per cent. increase in power capacity.

7. Portions of the outer forebay wall of the Municipal plant are unsafe and should be reinforced. A portion of the cost of raising the dam and headworks could rightly be charged against this. The final solution of this problem will necessitate the determination of comparative capital and annual costs of dam construction, and the location of flood contours from the headworks of the Municipal

Plant to the head of Mill Lake. With this information available it will be possible to decide definitely as to the proper basis upon which to establish a scheme for the development of artificial storage in the watershed of the Seguin River.

As regards Mountain Rapids, it may be said that while the topographical conditions are not favourable as a whole, it would in all probability be commercially feasible to install a plant at that point should future market expansion require it. The natural head is about 25 feet, and anything up to 40 feet could be obtained by acquiring the necessary back-water privileges. The development of Mountain Rapids is, however, a matter for future consideration, as the augmented flow derived from storage will at present provide much more economically for the Town's growing needs in the matter of power.

October 10, 1912.

REPORT NO. VII

Markham

For a period extending from May, 1912, up to the present time discharge measurements have been made and records of water level kept, in order that sufficient hydraulic data might be obtained to advise the Municipality in the matter of the proposed purchase of two mill-powers on Rouge Creek in the vicinity of the village.

Rouge Creek has a watershed area of about 65 square miles above the lower mill site. Owing to the restricted area of the watershed, the flow regulation under natural conditions would not have been good, and clearing, drainage and cultivation, together with the existence of dams on the upper reaches of the stream, have so accentuated this condition as to largely discount the value of the stream as a dependable source of power in commercial quantities.

As regards development, one proposal was to build a dam below the tail-race of the Reesor Mill and create a 30 foot head by drowning out the Reesor dam and the Milne dam immediately above. Another scheme was to reinforce the embankment and build a dam under the new 8th Concession bridge for a 30 foot head.

A survey covering both schemes having been made, it was found that the proposition to develop power at the 8th Concession bridge was impracticable, while a 30 foot head below the Reesor dam was a possibility if the stream could be depended upon to furnish a sufficient volume of flow to make development commercially feasible.

Measurements of flow taken since last May show the following results:

May 14, 1912.—Above Milne's dam, 23 cubic feet per sec.

May 14, 1912.—Below Reesor's dam, 24 cubic feet per sec.

June 21, 1912.—Below Reesor's dam, 23 cubic feet per sec.

July 16, 1912.—Below Reesor's dam, 7 cubic feet per sec.

August 27, 1912.—Below Reesor's dam, 11 cubic feet per sec.

Sept. 14, 1912.—Below Reesor's dam, 42 cubic feet per sec.

Oct. 14, 1912.—Below Reesor's dam, 19 cubic feet per sec.

On the basis of the above figures, the maximum quantity of continuous 24 hour power available under a 30 foot head would have been 105 h.p., and the minimum would have been 17 h.p. It is to be understood that these figures do not represent the natural discharge of the stream owing to the existence of a number of dams above the point of measurement, but they represent a condition which would have to be contended with, because natural flow conditions would never obtain as long as these dams are used and operated. Taking the area and physical characteristics of the watershed into consideration, it is probable that not more than 10 cubic feet per second of discharge could be depended upon under conditions of minimum flow. This would mean about 25 h.p. 24 hour power under a 30 foot head, and with the pondage which the development of the lower site could provide, probably 50 h.p. of 10 hour power would be available.

The development of the site below the Reesor dam would involve the construction of about 750 feet of earth embankment and spillway, having a maximum height of 35 feet, and a power-house and wheelpit designed to meet local conditions. Added to this would be the cost of a transmission line to the village, the purchase price of the Milne and Reesor mill-sites, and the purchase of about

175 acres of additional back-water privileges. The expenditure which this represents would be justified if the development of several hundred horse-power were involved, but in view of the small quantity of power which the investment would provide, it does not require the compilation of a detailed estimate to prove the impracticability of the scheme from an economic standpoint.

The final conclusion is, therefore, that while the Milne and Reesor properties may be valuable assets to the present owners as mill-powers, they would be of little or no value to the Municipality as a dependable source of electrical energy.

It is possible that either one of the properties above mentioned might, in its present condition, be of some value to the Municipality for auxiliary purposes, as the capacity of either site at various stages of flow could be used to supplement the steam, and such pondage as would be available could be used on the peak load. The economy of this scheme would depend primarily upon the first cost of the site, and then upon the amount of investment necessary to adapt it for auxiliary service. There would probably be some difficulty in the matter of the first cost, as both sites are of more value to the present owners than they would be to the Municipality when the difference in the class of service required is taken into consideration.

October 30, 1912.

REPORT NO. VIII

Smith's Falls

The local source of hydraulic power for the Municipality is the Rideau Canal, power at Smith's Falls locks and at Old Sly's locks being developed at the present time. These water powers have the usual characteristics of canal powers. The supply of water is controlled primarily for navigation purposes, and it is impossible at the present time to make any accurate estimate of the dependable capacity of the various power sites from which Smith's Falls draws its present supply of hydraulic power. In this connection, it may be mentioned that there are two well-built wooden weirs in the waste gate channel of the lower locks. Barring leakage, this channel carries the whole surplus discharge of the Rideau River, and by measuring the head on these weirs night and morning the volume of flow available for power purposes throughout the year could be accurately ascertained. The work of measuring the head on these weirs could quite easily be done by the Engineer in charge of the Town pumping station, and the information thus obtained would be very valuable.

The power at the upper Smith's Falls lock is developed by the Citizens' Electric Co., above mentioned, the normal head being said to be about 9 feet. It is claimed that this site has a dependable capacity of 200 h.p. The wheels at present installed are of a vertical type operating on a jack-shaft, and the hydraulic installation as a whole probably operates at an efficiency not greater than 50 per cent. There are several industries at the lower Smith's Falls lock operating under heads varying from 13 to 18 feet, the water being divided between the industries on each side of the stream, the weirs above mentioned having been installed for the purpose of making this division. There is an available head at this point of about 25 feet, and physical conditions are such that this head could be economically developed if the various interests could be consolidated. A plant operating under this head might be expected to have a dependable capacity of 400 to 500 h.p.

The Smith's Falls Electric Power Co utilizes a 16 foot head at the Old Sly's locks, a mile and a half below the town. The hydraulic installation consists here also of vertical wheel settings with jack-shaft. It is stated that this plant has sufficient hydraulic capacity to carry the peak load of 480 h.p. from December to May, the steam auxiliary only being required during the navigable season.

In connection with the shortage of power during the navigation season, it is reported that large quantities of water are drawn out of the upper lakes during the summer to maintain navigable depth upon the lower reaches of the canal, and it is stated that the greater portion of the water thus drawn off is required to compensate for leakage through some of the older dams on the lower canal. While this statement has not been verified, there is no doubt that considerable leakage does take place through some of the older wooden dams on the system, and if these dams were rebuilt or properly repaired the power conditions would certainly be improved. The dependable hydraulic capacity at the Old Sly's locks under present conditions is probably in the neighborhood of 250 to 300 h.p., although as regards the estimated hydraulic capacity of this site and the other sites above mentioned, the records of weir measurements might possibly show better results, more especially if leakage through the various dams on the system were eliminated.

It is evident from the above that the power situation in Smith's Falls is a very complicated one, there being a limited supply of power on the Rideau Canal which could be delivered to the consumer at a price which transmitted power could probably not meet under any circumstances. The market for light and small blocks of power is divided between two existing companies, and although neither company is operating under a franchise, the parties in control have lived in the Town all their lives and there would probably be a strong local sentiment against any drastic measures which might be taken to eliminate them and clear the field for a municipal service. If the Municipality were to consider the question of purchase they could not, from a commercial standpoint, be advised to buy out both companies, and if it came to a matter of choice the plant of the Smith's Falls Electric Power Co. would seem to be the best one to consider, as they have the greater hydraulic capacity and the more comprehensive distribution system. It is to be noted that the only end gained by the purchase of this plant would be to eliminate competition without inflicting such injury upon the present owners as might be caused by entering into open competition with an independent plant, as the only physical asset of real value which the town would obtain would be the auxiliary steam plant which has recently been installed. To put the plant in proper operating condition the hydraulic portion of the plant would require to be practically rebuilt, and the distribution system would require to be almost entirely rewired and renovated.

As regards the best means of supplying the market requirements which exist over and above the capacity of the local plants, there are two schemes which appear feasible or which may become feasible. One is to supply the Municipality with power from High Falls on the Mississippi River. There would probably be sufficient continuous capacity at High Falls to supply the requirements of Smith's Falls and Perth for some years to come, but the supply from this source nevertheless has a definite limit which is not much in excess of the present requirements of these two towns. It is probable, however, that up to the limits of its capacity High Falls power could be supplied cheaper than from any other adequate or available source. On the other hand, if these towns wish to have a source of power with sufficient capacity available to meet all possible future needs the Chats development on the Ottawa River is the only one to consider.

Taking everything into consideration, from the standpoint of both the Municipality and the Commission, it would seem advisable to ascertain if the property of the Smith's Falls Electric Company can be obtained for a price within reason and if so, advise the Town to take over and remodel this system, put the charging rates on a proper basis, and take no further action until such time as the Commission is in a position to announce definitely its policy regarding the development at the Chats, and its final plans as to the means of supplying power to the Eastern Municipalities.

April 10, 1912.

REPORT NO. IX

Meaford

The hydraulic plant of the Georgian Bay Power and Milling Co. is located on Big Head Creek about a mile above the Town of Meaford, and a report on the same was required for the purpose of making recommendations in connection with the proposed purchase of the Company's power plant and distribution system by the Municipality, the object being to use the plant in connection with a temporary auxiliary steam installation until such time as the development of the market might make it necessary to enter into a contract with the Commission.

Dam:

The Company's dam was partially destroyed this spring by the flood, a section of about 200 ft. having been washed out completely. A spillway section about 225 ft. long still remains. This portion of the dam is still tight, being built of round logs with rock and gravel fill, and it has a good width of apron. The structure is founded on a very good quality of hard pan, and the proper replacing of the washed out portion of the dam does not present any structural difficulty.

Forebay:

The forebay consists of a small basin, to which access is given from the main pond by a short cut in which a wooden control gate is placed. The forebay embankment is a combination of dry wall and brush and clay fill, the cross section of the embankment being too light for absolute safety. The head block is a wooden structure and contains an iron trash rack and a wooden control gate for the flume.

Flume:

The flume is of wood stave construction with round, iron hoops. The first section is 840 ft. in length and 6 ft. in diameter, and ends in a surge chamber built of squared timber. The remaining 260 ft. of flume is 5 ft. in diameter and contains a steel double elbow.

The wheel chamber is constructed of squared timber on a steel concrete foundation, and is fitted with a wooden surge pipe about 3 ft. in diameter. The flume is fairly well constructed and is in serviceable condition at the present time, although there was evidence of considerable leakage, and there was no apparent reason for the insertion of the steel elbow above mentioned. The main objection to the flume is that it is wrongly located, and that the rock and earth fill upon which it is laid without saddles or any other form of support is liable to cause more rapid depreciation and decay than would otherwise be the case.

The concrete foundations of the wheel chamber are in very bad condition and should be renewed, as the quality of the concrete is such as to make the foundation piers unsafe.

Tail-race:

The tail-race has not sufficient capacity for the discharge of tail water under full load, and a small additional expenditure in excavation would probably make available an extra 2 ft. of head.

Turbine:

There is one Barber wheel installed of the double horizontal central discharge type running at 300 r.p.m. with 30 in. diameter wheels.

Generator:

The generator is a C.G.E. 200 kw., 2,300 volt, 3-phase, 60 cycle, 600 r.p.m machine and is belted to the turbine shaft with a 2:1 pulley ratio. The belting of a 600 r.p.m. generator to the 300 r.p.m. turbine is not good practice, as the charge against loss of efficiency and extra power-house capacity will greatly exceed the extra charge on a 300 r.p.m. generator.

Power-House:

The power-house is of concrete construction with a wood roof, with living rooms adjoining the machine room, the structure being of substantial character and well preserved. The plant, as a whole, is awkwardly and inefficiently designed and is a very expensive one for the amount of power said to be available.

Power Capacity:

Very little definite information is available at the present time with regard to the capacity of the Company's power site, but they claim that 300 h.p. is available for eight months of the year, and at least 100 h.p. available for the remaining four months of the year. Taking into consideration the drainage area tributary to the plant and the available head, the minimum capacity of the plant might reasonably be estimated at 100 h.p., but whether or not a capacity of 300 h.p. can be maintained for eight months in the year is a matter requiring further investigation. For the purpose of this report, however, the capacities vouched for by the owners of the plant will be assumed. On this basis, therefore, the continuous supply of 300 h.p. will require auxiliary power, and inquiries made appear to indicate that a temporary auxiliary steam plant of 200 h.p. capacity can be provided for about \$5,000.00.

Cost to Produce Power:

Figures obtained from the Company indicate that the first cost of hydraulic plant amounted to \$42,052. Taking the different items of plant and equipment separately, and taking into consideration the respective number of years they had been in use, the present value of the plant works out about \$28,768.

It is estimated that the replacing of the washed out portion of the dam and sundry repairs and improvements to the hydraulic plant will require about \$13,000. The total capital investment necessary to make 300 h.p. continuously available would therefore be:—

Present value of existing plant	\$28,768 00
Alterations and repairs to power plant.....	13,000 00
Temporary auxiliary steam plant	5,000 00
	<hr/>
	\$46,768 00

A fair estimate of Annual Charges would be:—

Operation and Administration	\$2,000 00	
Maintenance and Depreciation	2,159 00	
Auxiliary steam—200 h.p. at \$15.00	3,000 00	
Annual payment on Municipal Loan (proportion)	2,420 00	
Total Capital Cost	\$46,768 00	
Municipal Loan (Proportion)	16,810 00	
<hr/>		
Cash Balance	\$29,958 00	
Fixed Charges, 6.8% on \$29,958.00		2,040 00
Insurance, etc., $\frac{1}{2}\%$ on \$46,768.00		239 00
		<hr/>
		\$11,858 00

The total annual cost to produce 300 h.p, is, therefore, \$11,858, or an average annual cost of \$39.50 per h.p. per year.

The high costs derived above are due to two causes,—first, to the small quantity of power available in proportion to the capital investment, and second, to the abnormally high maintenance and depreciation charge which the type of construction necessitates. If this plant continues under private ownership, the proprietors, by economical operation and by ignoring the annual liability of depreciation and proper maintenance, may for a few years produce and sell power at a price which might be acceptable to the Town of Meaford, but the Commission could not recommend the purchase of the plant as a valuable hydraulic property.

May 11, 1912.

REPORT NO. X

Chesley

The local source of hydraulic power available for the Municipality of Chesley is the north branch of the Saugeen River, which flows through the town, and at the request of the Municipal authorities, the Hydro-Electric Commission made certain surveys, and for some months past has carried on investigations with a view to ascertaining whether a sufficient quantity of power could be developed to meet the requirements of the Municipality at reasonable cost.

The matter of first importance in this investigation was the determination of the volume of stream flow at various seasons of the year, and since July, 1911, monthly measurements of flow have been made at a cross-section located a short distance below the town, the results to date being tabulated hereunder:—

Date of measurement.		Flow in cubic feet per second.	Date of measurement.		Flow in cubic feet per second.
July	17, 1911.....	164	Jan.	24, 1912.....	180
Aug.	16 ".....	140	Feb.	21 ".....	180
Sep.	13 ".....	168	Mar.	26 ".....	233
Oct.	13 ".....	174	Apl.	11 ".....	2,150
Nov.	7 ".....	185	Apl.	24 ".....	369
Dec.	19 ".....	181			

In view of the fact that the area of watershed above Chesley is only about 88 sq. miles, according to the best existing maps, the condition evidenced by the above records is most remarkable. The August measurement of 140 sec. ft. was the minimum and shows a minimum run-off of 1.99 sec. ft. per square mile of watershed, a figure which far exceeds that of any other stream in the Province as far as is known at the present time. Owing to the possibility that the August measurement may not have been taken at the extreme low stage of flow, the capacity of the stream will be based upon a minimum flow of 100 sec. ft., and even this figure will be considered as open to question until further measurements have been made during periods of low water.

A discharge of 100 sec. ft. will produce about eight (8) continuous 24 hr. electrical horse power per foot of head. Assuming that it would be advisable to have not less than 200 h.p. of continuous capacity available under conditions of minimum flow, the development of a 25 foot head would be necessary. The site best fulfilling this condition is just below the town, and takes in Elliott's mill and tailrace and a long bend in the stream immediately below. A detailed survey of this site showed a difference in level of 29 feet between Elliott's mill-pond and the foot of the bend, and the contours as developed showed that a head of 25 to 30 feet could be controlled with a reasonable amount of back-water damage.

The difference in level between the head and foot of the bend was 11 feet at the time the survey was made, and the topography of the site is such that two equally efficient schemes of development are possible, namely:—

To build a dam at the foot of the bend controlling the full head up to Elliott's mill-pond and to place the power-house beside the dam; or:—

To build a smaller dam at the head of the bend controlling the head up to Elliott's mill-pond, and to excavate a head-race across the neck of the bend, placing the power-house at the lower end of the same.

As regards rights and privileges, the first scheme would entail:—

- (1) Purchase of the Elliott property.
- (2) Purchase of flooding rights above the dam amounting to approximately 102 acres, exclusive of the Elliott property.

(3) Purchase of the site for the power-house and dam and entrance to same.
The second scheme would entail:—

- (1) Purchase of the Elliott property.
- (2) Purchase of flooding rights above the dam, amounting to approximately 20 acres, exclusive of the Elliott property.
- (3) Purchase of site and right-of-way for dam and head-race.
- (4) Purchase of site for power-house and entrance to same.
- (5) Purchase of riparian privileges along the course of the stream between the dam and power-house, made necessary by the possible diversion of the full flow through the head-race during periods of low water.

In the estimates submitted herewith, no allowance has been made for the costs relative to the above items, as they can be appraised more accurately by the local authorities. Any sums which it may be necessary to expend in acquiring development rights and privileges under either scheme can simply be added to the total capital costs as given in the estimates. The annual costs in the estimates must also be increased by the amount of the interest and sinking fund charges on the above sums.

The estimates for each scheme cover the capital cost of a first-class, permanent installation with a concrete dam and power-house, and two hydro-electric units each of 200 h.p. capacity. The dam, wheel-pits and power-house foundations are large items of the capital cost, owing to the nature of the material on which they would be built. The expenditure necessary to make these structures safe and permanent is greatly in excess of what would be necessary if they were founded upon rock.

The annual costs include interest on capital investment, a sinking fund charge sufficient to retire the total debenture issue in 30 years, maintenance and depreciation, operation and administration, and an allowance for insurance and sundries.

As to which scheme of development is the better, it will be noted that scheme No. 1 will provide a much greater area of pondage and consequently more 10 hr. power capacity, than scheme No. 2, but a final decision on the matter should be withheld until the cost of acquiring the various development rights and privileges relative to each scheme has been ascertained.

Scheme No. 1:

Involving the construction of a dam controlling the total head, and located beside the power-house at the foot of the bend.

Capital Cost:

Dam, Power-house and Permanent Works	\$41,620 00
Hydro-Electric Equipment	12,100 00
Excavation and fill	4,110 00
Total	\$58,830 00
Engineering and Contingencies, 10%	5,883 00
Interest during Construction, 3%	1,765 00
Total Capital Cost	\$66,478 00

Annual Charges:

Maintenance and Depreciation	\$974 00
Annual Interest and Sinking Fund, 6.8% on \$66,478	4,525 00
Operation and Administration	2,000 00
Insurance, etc., ½% on \$66,478	332 00
Total Annual Charges	\$7,831 00
Annual Cost of 200 h.p. 24 hr. power, delivered at switchboard, \$39.15 per h.p.	
Annual Cost of 400 h.p. 10 hr. power, delivered at switchboard, \$19.58 per h.p.	

Scheme No. 2:

Involving the construction of a dam at the head of the bend, and the excavation of a head-race between dam and power-house.

Capital Cost:

Dam, Power-house and Permanent Works	\$32,755 00
Hydro-Electric Equipment	13,100 00
Excavation and fill	9,150 00
Total	\$55,005 00
Engineering and Contingencies, 10%	5,500 00
Interest during Construction, 3%	1,650 00
Total Capital Cost	\$62,155 00

Annual Charges:

Maintenance and Depreciation	\$944 00
Annual Interest and Sinking Fund, 6.8% on \$62,155	4,225 00
Operation and Administration	2,000 00
Insurance, etc., ½% on \$62,155	311 00
Total Annual Charges	\$7,480 00
Annual Cost of 200 h.p. 24 hr. power delivered at switchboard, \$37.40 per h.p.	
Annual Cost of 400 h.p. 10 hr. power delivered at switchboard, \$18.70 per h.p.	

If it is considered advisable at the outset to install only one 200 h.p. unit, the capital cost under Scheme No. 1 would be \$59,000, and under Scheme No. 2, \$54,700.

For Scheme No. 1 a fair estimate of Annual Charges would be:

Maintenance and Depreciation	\$700 00
Annual Interest and Sinking Fund, 6.8%	4,000 00
Operation and Administration	1,500 00
Insurance, etc.	295 00
Total Annual Charges	\$6,495 00
Annual Cost of 200 h.p. delivered at switchboard, \$32.48 per h.p.	

For Scheme 2:

Maintenance and Depreciation	\$700 00
Annual Interest and Sinking Fund, 6.8%	3,700 00
Operation and Administration	1,500 00
Insurance, etc.	274 00

Total Annual Charges	\$6,174 00
Annual cost of 200 h.p. delivered at switchboard, \$30.87 per h.p.	

May 16th, 1912.

REPORT NO. XI

Burnt River

Burnt River rises in the Townships of Dudley, Harcourt and Monmouth in the District of Haliburton, flows in a south-westerly direction and empties into Cameron Lake on the Trent Valley Canal in the County of Victoria.

Its drainage area above Burnt River Station is approximately 421 square miles.

The recorded mean annual rain fall at Haliburton is about 29.66 inches, and it is assumed that $33\frac{1}{3}$ per cent. of the total precipitation over the water-shed, or 9.89 inches, would be available for power purposes. This estimate seems conservative considering the favorable geological and topographical features of the water-shed.

A run-off of 9.89 inches from a water shed of 400 square miles would produce a total discharge of 9,760 million cubic feet per annum which, if totally conserved, would give a continuous uniform discharge of about 306 sec. feet or 25.5 continuous 24 hour electric horse-power per foot of head at Burnt River.

The above figures merit consideration owing to the fact that the large lake area in the upper water-shed of the Burnt River affords unusually good facilities for improvement of flow conditions by means of artificial storage.

The storage capacity of these lakes, fully developed, would amount to about 4,000 million cubic feet according to an approximate estimate.

This volume of storage is nearly half of the total estimated volume of run-off from the water shed, so that there is no doubt that the installation of storage works would materially improve the flow characteristics of the Burnt River. A peculiar feature of the Burnt River water shed is that all the storage basins are located in the head waters of the stream, the tributary water-shed being about 270 sq. miles in extent. The remaining 150 sq. miles of water shed above Burnt River Station contains no storage basins worthy of consideration. This condition is a distinct disadvantage in that no facilities are afforded for centralization of control or for peak load storage, so that the flow can be regulated only with a view to making the discharge as uniform as possible and nothing more.

A storage capacity of 4,000 million cubic feet would provide a continuous discharge of about 190 sec. feet for 8 months in the year, which would be considered as being the volume of regulated flow available for power purposes, as the non-regulated surplus run-off of 5,700 million cubic feet should be able to maintain this minimum for the remaining 4 months of the year.

This discharge would give 16 e.h.p. per foot of head at Long Rapids near Burnt River Station, or at High Falls a few miles up the river where the flow would be practically the same.

During the latter part of June an examination was made of Burnt River from Kinmount to Burnt River Station, a distance of about 9 miles, and it was found that there are two possible power sites in that district. Each is really a long rapid, the first, High or Great Falls, having a total fall of about 24 feet and the second Long Rapids, a fall of from 14 to 15 ft.

At High Falls a head of 27 feet might be realized by a comparatively inexpensive development, while at Long Rapids probably a head of 19 feet might be

obtained. With a capacity of 16 e.h.p. per foot of head at High Falls there could be developed 432 e.h.p. and at Long Rapids 304 e.h.p., or a combined 24 hour capacity of 736 e.h.p. Both developments would be deficient in 10 hour capacity owing to there being practically no pondage.

Should it be decided to develop only one of these powers, High Falls would be the preferable to Long Rapids. For temporary storage purposes the present lumbermen's dams on the Upper Lakes would suffice.

July 22, 1912.

REPORT NO. XII

Mountain Lake

The Mountain Lake power site is owned by F. S. Wilson, Esq., of the J. C. Wilson Co. of Glenora, and hydraulic power is produced for the purpose of operating a machine shop, foundry and grist mill. The machine shop runs practically continuously six days a week, eleven hours a day, and uses about 28 h.p., while the grist mill and a storehouse, which use the greater amount of power, operate intermittently, being frequently closed for a week or more at a time.

The gross operating head is between 165 and 170 feet, the mean effective head being probably not less than 160 feet.



Mountain Lake, Approach Channel to Weir.

Although there is sufficient turbine capacity installed to generate about 130 h.p. it is probable that 75 h.p. would amply cover the average annual demand. On a basis of 66 hours a week operation the annual expenditure of energy would therefore, be about 257,400 h.p. hours. If this amount of energy were expended uniformly and continuously over the whole year of 365 days, it would be equivalent to about 30 h.p. continuous 24 hour power. With the turbine installation at present existing, this amount of power would be produced by a continuous uniform outflow from the lake of about 3 cu. ft. per second. Allowing 2 cu. ft. per second for leakage, the total discharge required would, therefore, be 5 second feet.

Five second feet flowing for one year would deliver a total volume of 157,680,000 cu. ft. of water. The area of the lake with its tributary water-shed could be reasonably taken at 600 acres, and assuming 12 inches of precipitation available for power purposes, the total surface inflow into Mountain Lake would amount to 26,136,000 cu. ft. per annum. Subtracting this amount from the total quantity above specified as being delivered to the wheels, leaves a remainder of 131,544,000 cu. ft., which is, therefore, the annual volume of delivery from underground sources. This volume of underground supply is equivalent to continuous

uniform flow of 4.2 cu. ft. per second, which, on the basis of the above assumptions, would be the average volume of discharge from the underground supply.

The above figures constitute practically all the information that could be derived from the data in existence when the investigation of the power site first came up for consideration.

Owing to the existence of a market for power in the Town of Picton, about 4 miles from the power site, it was considered necessary to investigate conditions in greater detail in order to ascertain definitely whether or not there existed in this power site a sufficient capacity to supply the requirements of the town, and in this connection the first step was to devise some means of accurately measuring the discharge out of the lake.

The lake is located at the top of a precipitous hill on the south shore of Picton Bay, the difference in level between the Bay and the Lake being ordinarily about 175 feet, the shores of the two bodies of water being not more than 600 feet apart. The water is carried from the lake through a small head gate and several hundred feet of riveted steel pipe to which the various wheels are connected at the foot of the hill. Owing to the leakage in the pipe and the absence of data relating to the volume of discharge through the wheels, it was necessary to use some other means of measuring the discharge from the lake. It was found upon examination that the only practical means of doing this was to excavate a channel about 150 feet long from the lake into the bed of a small brook, which was evidently at one time the lake's natural outlet. This channel was excavated 12 ft. wide and to an average depth of about 2 ft., and at the head of it was placed a sharp crested weir having a clear width of 12.01 feet. With the weir so placed it was possible to get the maximum head of $11\frac{1}{2}$ inches on the crest, which was equivalent to a total discharge of about 37.6 cu. ft. per second. Discharge readings were taken on this weir at intervals of 15 minutes between 3.15 p.m. on Sept. 7th and 3.15 a.m. on Sept. 8, the work having been done on Sunday in order that the mills could be closed down and the head gate tightly closed. The readings taken over this 12 hour interval showed a total volume of 1,450,202 cu. ft. and it was also observed that during this 12 hour period the surface of the lake had dropped 1.56 inches. This drop in water level indicated that the measured outflow was composed of the underground discharge plus a volume of water corresponding to a drop in lake level of 1.56 inches.

During the course of the investigation an accurate stadia survey was made of the lake, and the area was found to be 9,352,000 sq. ft., or about 215 acres, so that 1.56 inches drawn off this area would mean a total volume of 1,215,760 cu. ft. which was discharged over the weir. As above mentioned, the total discharge over the weir amounted to 1,450,202 cu. ft., so that the difference between these two totals, which amounts to 234,442 cu. ft., is a measure of the volume of supply from underground sources. This volume of flow delivered for a period of 12 hours is equivalent to a continuous discharge of about 5 cu. ft. per second, which is one of the results which the experiment was designed to supply.

At the conclusion of the above mentioned 12 hour period, the discharge was entirely shut off and it was found that for a subsequent 12 hour period the lake showed no tendency to fill up, the gauge readings being practically the same at the end of the second 12 hour period as at the beginning. In this connection, it is to be noted that the supply from which the lake was to be refilled had been ascertained to be 5 cu. ft. per second. With this volume of inflow it would require about 80.5 hours for the lake to fill to the original level, which would be at the

rate of slightly less than $\frac{1}{4}$ -in. every 12 hours. The slow rate of refilling, therefore, accounts to a certain extent for the absence of appreciable variation in level during the second 12 hour period, but sufficient evidence was obtained in any event to prove that the recuperative capacity of the lake is very small.

From the above, therefore, it seems evident that while the lake appears to be supplied by springs having a very large volume of discharge, the dependable power capacity would not be more than 75 h.p., and that while the site is eminently suited to the purpose for which it is now utilized, it cannot be considered an adequate source of power for general industrial purposes.

It is, of course, possible that if the lake level could be materially lowered a corresponding increase of flow from the springs could be anticipated. The lowering of the lake level would tend to reduce the power capacity through the reduction in head, and this would, to a certain extent, effect the tendency to augment the power capacity through the result of the increase in flow, so that there would be what might be termed a critical head at which the maximum power capacity would be realized. This critical head could, of course, only be ascertained by very expensive experimental procedure. As an example of what the result might be, it might be assumed that by lowering the lake 20 feet the discharge from the springs might be tripled, so that there would be a discharge of 15 sec. ft. operating under a head of 145 feet. This would produce about 198 mechanical horse power. It would seem, therefore, that under no conditions would the site have sufficient power capacity to make it an attractive commercial proposition.

While the work preparatory to the experiment was being done the records were kept of variations of lake level. During the first week of operations, when the machine shop only was running, the water level remained practically constant, while during the second week when the machine shop and grist mill were both running, the water level dropped about two inches, notwithstanding the fact that heavy rains occurred during that interval. During the second week of the observations, therefore, the power required to run the mills absorbed about 1,500,000 cu. ft. from storage in addition to the normal inflow from the springs, plus the precipitation during that interval. This affords additional evidence of the small capacity of the source of underground supply.

Sept. 25, 1912.

STREAM=FLOW DATA

BEAVER RIVER

Station.	Date of measurement.	Gauge Height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
Eugenia Falls.....	Feb. 25, 1912....	71	.96	(a) Flood conditions 0.8 ft. above level of 1911.
".....	Apr. 12, 1912....	.....	868 (a)	11.73
Thornbury.....	Aug. 22, 1912....	.....	234	.92
".....	Sep. 23, 1912....	.....	215	.85
".....	Oct. 24, 1912....	.....	225	.89

BLANCHE RIVER

Englehart	Aug. 1, 1911....	.....	461	2.00	
".....	Aug. 31, 1911....	.....	233	1.00	
".....	Oct. 11, 1911....	.....	147	.64	
".....	Jan. 11, 1912....	.....	191	.83	
".....	Mar. 7, 1912....	.....	122	.53	
".....	Mar. 30, 1912....	.....	161	.70	

BOYNE RIVER

Alliston	June 11, 1912....	66	.85	(a) Estimated from surface flow. No velocity for metering.
".....	July 6, 1912....	.....	12 (a)	.....
".....	Aug. 9, 1912....	.....	66	.86
".....	Sep. 13, 1912....	.....	27	.36
".....	Oct. 13, 1912....	.....	50	.65

CREDIT RIVER

Cataract Jct.....	June 24, 1912....	10.15	52	.57	(a) Water rose during time of measurement.
".....	July 22, 1912....	10.30	67	.73	
".....	Aug. 29, 1912....	10.20	54	.59	
".....	".....	10.30	76 (a)	.84	
".....	Sep. 30, 1912....	10.40	87	.96	
".....	".....	10.50	98	1.07	
".....	Oct. 31, 1912....	10.20	53	.59	
".....	".....	10.40	90	.99	
".....	".....	".....	".....	".....	
".....	".....	".....	".....	".....	

GRAND RIVER

Brantford	Aug. 14, 1912....	.....	1,271 (a)	.58	(a) 4 miles above Brantford.
".....	Sep. 17, 1912....	.....	3,754 (b)	1.72	
".....	Oct. 16, 1912....	.....	1,500	.69	(b) T. H. B. bridge and Western Counties Canal.
Glenmorris	Aug. 14, 1912....	13.12	823	.54	
".....	Sep. 18, 1912....	13.82	1,664	1.09	
".....	Oct. 17, 1912....	13.32	883	.58	
Blair.....	Aug. 15, 1912....	17.00	433	.42	
".....	Sep. 19, 1912....	17.6	1,113	1.10	
".....	Oct. 18, 1912....	16.9	377	.37	
Elora.....	Aug. 16, 1912....	5.4	129	.25	
".....	Sep. 20, 1912....	5.75	243	.46	
".....	Oct. 18, 1912....	5.50	133	.25	

GULL RIVER

Station.	Date of measurement.	Gauge height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
Minden	July 27, 1911		532	1.33	(a) Possibly in error.
"	Sept. 6, 1911		546	1.36	
"	Oct. 9, 1911	4.9 (a)	642	1.60	
"	Nov. 3, 1911	4.2	448	1.12	
"	Dec. 9, 1911	5.45	696	1.74	
"	Jan. 10, 1912	4.9	569	1.42	
"	Feb. 9, 1912	4.1 (a)	410	1.02	
"	Mar. 8, 1912	3.8 (a)	405	1.01	
"	Apr. 15, 1912	6.6	1,124	2.81	
"	May 15, 1912	7.3	1,613	4.03	
"	June 13, 1912	5.7	780	1.95	
"	July 15, 1912	7.0	1,561	3.90	

NOTE.—This river regulated by artificial storage for Trent Valley Canal.

MAGNETAWAN RIVER

Katrine (a)	June 15, 1912		473	3.13	(a) Above Doe Lake.
"	July 4, 1912		192	1.27	
"	Aug. 3, 1912		105	.69	
"	Sep. 5, 1912		107	.71	
"	Oct. 7, 1912		132	.87	
Burk's Falls	June 14, 1912		1,504	4.18	
"	July 5, 1912		340	.94	
"	Aug. 4, 1912		240	.67	
"	Sep. 6, 1912		251	.69	
"	Oct. 5, 1912		330	.91	
Byng Inlet	Oct. 10, 1912	3.6	391	.....

MAITLAND RIVER

Benmiller	May 19, 1911	14.27	979	1.03	(a) Gauge heights not reliable, due to ice conditions.
"	June 14, 1911	13.80	549	.58	
"	July 30, 1911	13.60	306	.32	
"	Aug. 11, 1911	13.37	172	.18	(b) Discharge estimated from surface velocity.
"	Sep. 18, 1911	13.39	170	.18	
"	Oct. 16, 1911	13.55	257	.28	
"	Nov. 20, 1911	15.34	4,069	4.28	(c) Measurements taken two miles below Benmiller on account of ice:
"	Dec. 22, 1911	14.3 (a)	1,280	1.34	
"	Jan. 27, 1912	(a)	752 (c)	.79	
"	Feb. 29, 1912	(a)	506 (c)	.53	
"	Mar. 28, 1912	(a)	2,117	2.22	
"	Apr. 6, 1912	18.80	23,582 (b)	24.75	10.15 a.m.
"	Apr. 6, 1912	20.26	41,061 (b)	43.35	1.00 p.m.
"	Apr. 7, 1912	21.60	65,205 (b)	68.66	10.30 a.m. peak of flood.
"	Apr. 26, 1912	14.40	1,437	1.51	
"	May 30, 1912	16.13	5,815	6.12	
"	June 27, 1912	13.47	237	.25	
"	July 25, 1912	13.77	496	.52	
"	Aug. 26, 1912	14.17	929	.98	Heavy rains.
"	Sep. 26, 1912	14.37	1,405	1.48	"
"	Oct. 29, 1912	13.97	824	.87	"
Wingham (d)	June 17, 1911		218	.37	(d) Metering station below confluence of main stream and Harriston Creek.
"	July 18, 1911		140	.24	
"	Aug. 12, 1911		86	.15	
"	Sep. 19, 1911		81	.14	
"	Oct. 14, 1911		166	.28	
"	Nov. 19, 1911		2,446	4.17	
"	Dec. 19, 1911		879	1.49	

MUSKOKA RIVER

Station.	Date of measurement.	Gauge height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
High Falls (a).....	Sep. 8, 1911.....		124	.13	(a) North Branch, above Bracebridge.
"	Sep. 26, 1911.....		123	.13	
"	Sep. 26, 1911.....		104 (b)	.11	(b) Below Port Sydney.
"	June 6, 1912.....		2,828	2.91	
"	July 3, 1912.....		150	.15	(c) South Branch, above Bracebridge.
"	Aug. 2, 1912.....		193	.20	
"	Sep. 4, 1912.....		215	.22	(d) Log drive raised water 3 ft. in a few hours.
"	Oct. 4 1912.....		391	.40	
South Falls (c).....	Sep. 9, 1911.....		303	.39	
South Falls.....	Sep. 27, 1911.....		271	.35	(e) Below Muskoka Lake.
Tretheweys Falls ..	Aug. 2, 1912....	16.60	1,337	2.03 (d)	
"	Sep. 4, 1912....	13.30	349	.53	
"	Oct. 5, 1912....	13.50	414	.63	
Bala (e)	Oct. 12, 1912....		1,663	.71	

NOTTAWASAGA RIVER

Nicholson (a).....	June 11, 1912....	7.00	426	1.31	(a) Station at McLean's bridge.
"	July 6, 1912....	5.61	197	.61	
"	Aug. 9, 1912....	5.60	190	.58	
"	Sep. 12, 1912....	5.54	156	.48	
"	Oct. 13, 1912....	6.42	260	.80	

ROUGE CREEK

Markham	May 14, 1912....		24 (a)	.36	(a) Below Reesor's dam.
"	May 14, 1912....		23 (b)	.36	
"	June 21, 1912....		23 (a)	.36	(b) Above Milne's dam.
"	July 16, 1912....		7 (a)	.10	
"	Aug. 17, 1912....		11 (a)	.16	NOTE.—Volume of flow governed by operation of mills up stream.
"	Sep. 14, 1912....		43 (a)	.66	
"	Oct. 14, 1912....		69 (a)	1.06	

SAUGEEN RIVER.

Port Elgin.....	July 7, 1911....	4.65	491	.31	(a) Error in gauge reading evident.
"	Aug. 17, 1911....	4.55	399	.25	
"	Sep. 20, 1911....	4.65	506	.32	(b) Gauge heights not reliable owing to ice conditions.
"	Oct. 13, 1911....	5.10	692	.44	
"	Nov. 17, 1911....	(a)	4,704	3.01	
"	Dec. 20, 1911....	(b)	1,473	.94	
"	Jan. 25, 1912....	(b)	2,308	1.40	(c) Gauge height 20.0 on April 8, 1912, at peak of flood.
"	Feb. 24, 1912....	5.30 (b)	876	.56	
"	Mar. 27, 1912....	7.00	1,922	1.23	
"	Apl. 10, 1912....	13.80	19,436 (c)	12.45	
"	Apl. 25, 1912....	8.20	4,028	2.58	
"	May 29, 1912....	8.20	4,323	2.77	
"	June 26, 1912....	5.70	1,066	.68	
"	July 23, 1912....	5.70	1,116	.71	
"	Aug. 25, 1912....	6.10	1,482	.95	
"	Sep. 25, 1912....	6.50	1,965	1.26	
"	Oct. 27, 1912....	6.1	1,502	.96	
Walkerton	June 26, 1912....	15.65	679	.76	
"	July 23, 1912....	15.80	734	.82	
"	Aug. 23, 1912....	16.00	806	.90	
"	Sep. 26, 1912....	16.00	812	.91	
"	Oct. 25, 1912....	16.00	814	.91	

SAUGEEN RIVER.—Continued.

Station.	Date of measurement.	Gauge height.	Discharge in cubic feet per second.	Estimated run-off in sec. ft. per sq. mile.	Remarks.
Chesley	July 17, 1911....	3.95	164	1.82	(a) Gauge height measured in heavy wind. (b) Gauge height 8.2 on April 8, 1912. (c) Mill above closed for 2½ days.
"	Aug. 16, 1911....	3.85	140	1.56	
"	Sep. 13, 1911....	4.00	168	1.86	
"	Oct. 13, 1911....	4.20	174	1.94	
"	Nov. 7, 1911....	4.20 (a)	185	2.06	
"	Dec. 19, 1911....	4.20	181	2.01	
"	Jan. 24, 1912....	4.20	180	2.00	
"	Feb. 21, 1912....	4.20	179	2.00	
"	Mar. 26, 1912....	4.50	233	2.56	
"	Apl. 11, 1912....	7.50	2,151 (b)	23.89	
"	Apl. 24, 1912....	369	4.10	Note.—Volume of flow governed by operation of mills up stream. 5.15 p.m. 7.15 p.m. 4.00 p.m. 7.35 p.m. 10.30 p.m. 10.30 a.m. 5.00 p.m. 7.00 p.m.
"	May 28, 1912....	4.50	236	2.62	
"	June 25, 1912....	3.85	182	2.02	
"	June 25, 1912....	3.40	100	1.11	
"	July 24, 1912....	3.80	168	1.86	
"	July 24, 1912....	3.30	102	1.13	
"	Aug. 23, 1912....	3.30	96	1.07	
"	Aug. 24, 1912....	3.75	169	1.87	
"	Sep. 25, 1912....	3.50	118	1.31	
"	Sep. 25, 1912....	3.20	78	0.859	
"	Oct. 28, 1912....	3.50	121 (c)	1.35	

SEGUIN RIVER.

Parry Sound.....	June 8, 1912....	11.10	1,406	3.87
"	July 5, 1912....	9.00	293	.81
"	Aug. 8, 1912....	8.00	189	.52
"	Sep. 11, 1912....	8.40	244	.67
"	Oct. 11, 1912....	6.20	121	.33

SEVERN RIVER

Washago (a)	June 5, 1912....	19.90	6,173 (b)	2.97	(a) Outlet of Lake Simcoe. (b) Heavy rains for 3 weeks.
"	July 3, 1912....	17.00	3,469	1.67	
"	Aug. 1, 1912....	15.90	2,250	1.08	
"	Sep. 3, 1912....	15.80	2,118	1.02	
"	Oct. 3, 1912....	15.30	1,700	.82	

SOUTH RIVER

Powassan.....	Mar. 19, 1912....	.....	136	.42
"	Apr. 1, 1912....	.....	231	.72
"	June 7, 1912....	28.30	1,091	3.40
"	July 4, 1912....	24.40	174	.54
"	Aug. 5, 1912....	24.50	214	.67
"	Sep. 7, 1912....	24.50	213	.67
"	Oct. 7, 1912....	24.60	265	.82

STURGEON RIVER

Sandy Falls.....	Aug. 5, 1912	33.80	1,869	.85
"	Sep. 9, 1912	33.30	1,543	.70
"	Oct. 8, 1912	33.80	1,800	.82

THAMES RIVER

Station.	Date of measurement.	Gauge height.	Discharge in cubic feet per second.	Estimated rnn-off in sec. ft. per sq. mile.	Remarks.
London (a)	Mar. 12, 1912....	.....	284	.23	(a) On main stream.
"	June 29, 1912....	5.98	250	.20	
"	July 26, 1912....	5.90	195	.15	
"	Aug. 27, 1912....	6.30	435	.34	Heavy rains.
"	Sep. 27, 1912....	6.90	994	.78	
"	Oct. 30, 1912....	6.40	596	.47	

WAHNAPITAE RIVER

Wahnapiatae.....	Aug. 7, 1912....	32.00	1,807	1.98	
"	Sep. 10, 1912....	32.20	1,983	2.18	
"	Oct. 9, 1912....	32.00	1,794	1.97	

MISCELLANEOUS DISCHARGE MEASUREMENTS

River.	Date.	Discharge sec. ft.	Location.
Big Turtle.....	Sep. 8, 1912.....	542	Sand Island Falls.
Driftwood.....	Mar. 22, 1911.....	39	Monteith.
English.....	May 26, 1906.....	6,740	Pelican Falls.
"	June 2, 1906.....	6,702	Manitou Rapids.
Kaministiquia	Aug. 12, 1905.....	2,737	Fort William.
"	Sep. 6, 1905.....	2,091	Tonkin's Farm.
"	Oct. 6, 1905.....	1,355	" "
"	Feb. 3, 1906.....	1,100	Kakabeka Falls.
"	Mar. 10, 1906.....	880	" "
"	Sep. 8, 1905.....	882	Silver Falls.
"	Jan. 28, 1906.....	662	Silver Falls.
"	Mar. 6, 1906.....	494	Silver Falls.
Kawakashkagama.....	Sep. 20, 1906.....	159	Howard's Falls.
Montreal	Jan. 8, 1908.....	930	Gillies Siding.
Moirs	Oct. 25, 1905.....	700	Belleville.
"	Nov. 8, 1905.....	590	"
"	Dec. 5, 1905.....	946	"
Nipigon.....	Sep. 15, 1905.....	8,924	Pine Portage.
"	Nov. 3, 1905.....	7,014	Cameron's Pool
"	Feb. 9, 1906.....	5,982	" "
"	Mar. 23, 1906.....	5,879	" "
"	Sep. 30, 1906.....	5,884	" "
Onaping	Jan., 1906.....	254	High Falls.
Pic	Aug. 5, 1906.....	154	Lake Superior Portage.
Rainy	Oct. 25, 1905.....	14,145	Fort Frances.
"	Apr. 1, 1906.....	6,805	Fort Frances.
"	Sep. 26, 1910.....	5,229	Fort Frances.
Sturgeon (Nipissing).....	Jan. 19, 1906.....	1,230	Smoky Falls.
Severn	Aug. 22, 1905.....	1,206	Big Chute.
"	Nov. 9, 1905.....	1,503	Big Chute.
Sturgeon (Thunder Bay)	July 26, 1906.....	251	Beaver Falls.
Seine	July 9, 1906.....	1,842	Island Falls.
Trent	Oct. 16, 1905.....	2,200	Trenton.
"	Oct. 25, 1905.....	2,460	"
"	Nov. 7, 1905.....	2,196	"
"	Nov. 16, 1905.....	2,090	Healey Falls.
Vermilion	Jan., 1906.....	791	Wabageshik Chute.
Winnipeg	Oct. 14, 1905.....	5,321	Eastern Outlet.
"	Apr. 8, 1906.....	4,490	" "
"	Oct. 16, 1905.....	899	L. of W. Milling Co. head-race.
"	Oct. 16, 1905.....	400	Keewatin Lumber Co. flume
"	Oct. 18, 1905.....	21,794	Western Outlet.
Wabigoon.....	Oct. 9, 1905.....	206	Dryden.
Whitefish	Jan., 1906.....	207	Whitefish Falls.
"	146	Below Panache Lake.
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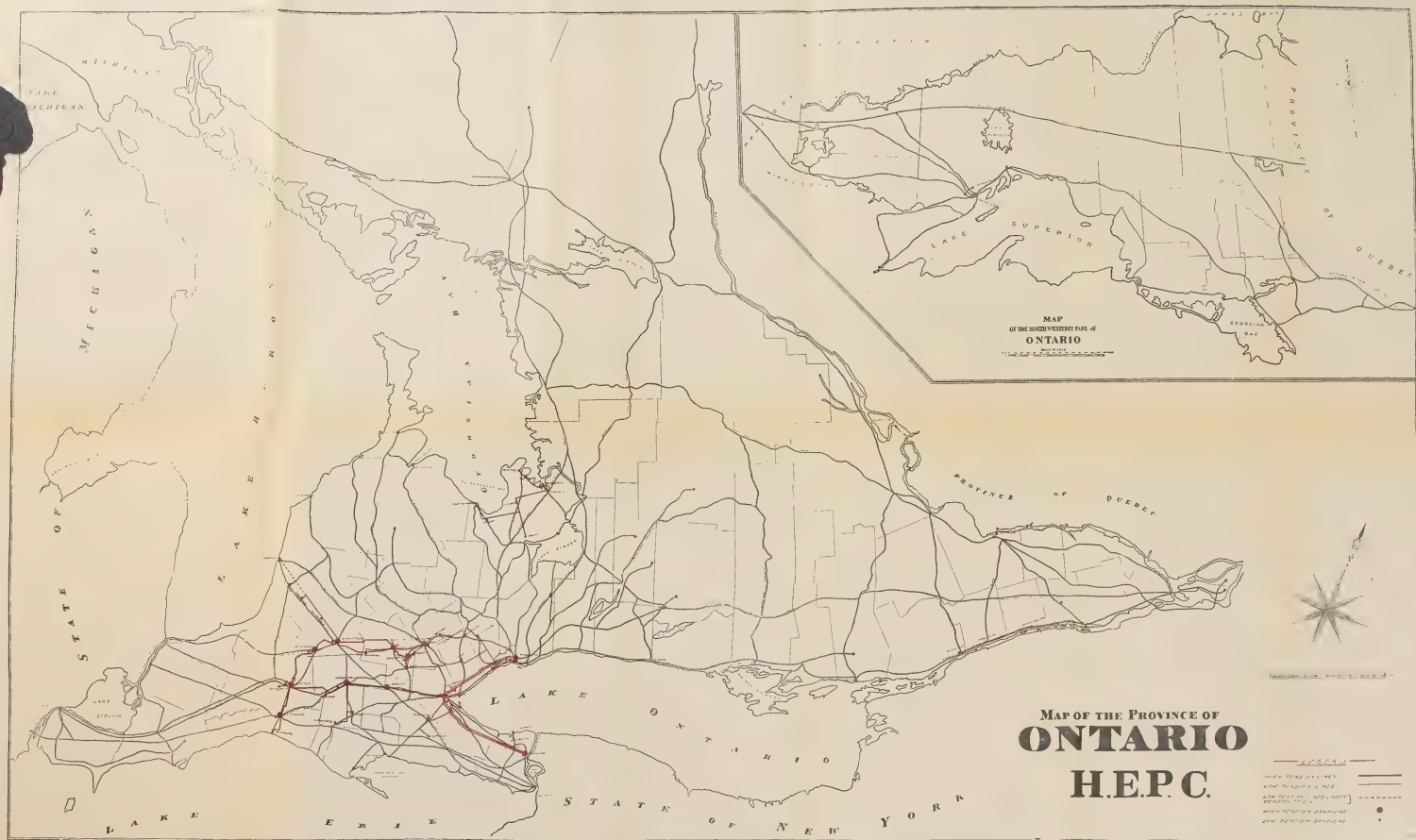
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